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AFWL-TR-
69-38

COMPILATION OF HUGONIOT EQUATIONS OF STATE

Brian J. Kohn
Lt. USAF

TECHNICAL REPORT NO. AFWL-TR-69-38

April 1969

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Air Force Systems Command
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New Mexico

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Kirtland Air Force Base
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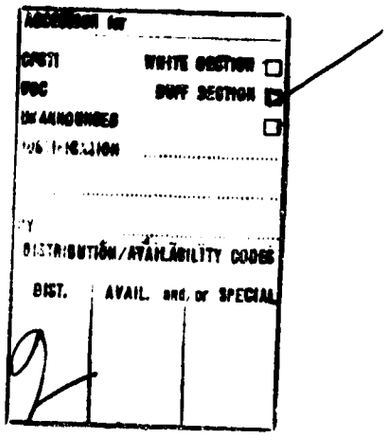

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COMPILATION OF HUGONIOT EQUATIONS OF STATE

Brian J. Kohn
Lieutenant USAF

TECHNICAL REPORT NO. AFWL-TR-69-38

FOREWORD

This report was prepared under Program Element 6.16.46.01.H, Project 5710, Subtask RAS 1114 (15.025), and was funded by the Defense Atomic Support Agency (DASA).

Inclusive dates of research were June 1968 to January 1969. The report was submitted 4 March 1969.

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This technical report has been reviewed and is approved.

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ABSTRACT

(Distribution Limitation Statement No. 2)

Computer codes for predicting material response to shock loading in and above the elastic region of a material require a knowledge of the Hugoniot equation of state. Hugoniot and material data have been compiled from various sources on materials of interest and presented in a form which condenses the needed computer code inputs to an easily accessible source.

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SYMBOLS AND UNITS

RHO	ambient density $\left(\rho_o\right)$(gm/cm^3)
E_s	sublimation energy (ergs/gm)
Γ	Gruneisen coefficient (calculated from $B^S \cdot \beta/\rho_o \cdot C_p$ or observed from shock wave experiments; dimensionless)
C_L	Longitudinal sound speed (cm/microsec)
C_S	transverse sound speed (cm/microsec)
C_B	bulk sound speed (cm/microsec)
B^S	adiabatic bulk modulus = $\rho_o C_B^2$ (Megabars)
AMU	shear modulus = $\rho_o C_S^2$ (Megabars)
CO	elastic Modulus (Megabars)
YMU	compression at which elastic limit is reached in terms of μ
β	thermal coefficient of expansion (volumetric)
Specific heat (Cp)	given in joules and at constant pressure
S	data pressure points (Megabars)
SCAL	calculated stress (Megabars)
PCAL	calculated hydrostatic pressure or, in the case of a simple least squares fit to P - μ data, a stress term (Megabars)
V, V_o	specific volume at final and initial compression, respectively
ETA	compressional term ρ/ρ_o or V_o/V (dimensionless)
U	calculated particle velocity (cm/microsec)
YADD	linear work hardening term (expressed at μ = 0.2) (Megabars)
μ	$\left(\rho/\rho_o\right) - 1$ or $\left(V_o/V\right) - 1$ (a nondimensional compression term)
C1, D1, S1	constants in cubic fit $P = C1\mu + D1\mu^2 + S1\mu^3$ for first plastic wave, expressed in Megabars
C2, D2, S2	constants in cubic fit $P = C2\mu^2 + D2\mu^2 + S2\mu^3$ for second plastic wave, expressed in Megabars

NOTE: All data points are referenced as to their source. Further, material properties available and included in this report are referenced as to source.

UNIT CONVERSION RELATIONS

1 gm/cm^3 (units of weight density) = 1 $dyne\text{-}sec^2/cm^4$ (units of mass density)

1 gram = 1 $dyne\text{-}sec^2/cm$ (= 980.7 dynes at acceleration of 1 gravity)

1 dyne = 1 gram - cm/sec^2

1 erg = 1 dyne - cm = 10^7 joules

1 calorie = $4.186 \cdot 10^7$ ergs = $4.186 \cdot 10^5$ $mbar\text{-}cm^3$ per unit area

1 tap = 1 $dyne\text{-}sec/cm^2$ = 1 bar-μsec

1 bar = 10^6 $dynes/cm^2$ = 14.5 psi = 0.987 atmosphere

1 psi = 69,000 $dynes/cm^2$ = $0.69 \cdot 10^7$ mbar = 70.31 $grams/cm^2$

1 kbar = 10^3 bar = 10^9 $dynes/cm^2$ (where kbar = kilobar)

1 mbar = 10^3 kbar = 10^{12} $dynes/cm^2$ (where mbar = megabar)

1 cal/gram°c = 1 BTU/lb°F

1 ft/sec = 30.48 cm/sec = 30.48×10^{-6} cm/μsec

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SECTION I

INTRODUCTION

The study of shock wave propagation in solids requires a knowledge of the pressure-volume-energy (P-V-E) equation of state of the material under consideration. Typically, the Mie-Gruneisen form of the equation of state is used along with the Rankine-Hugoniot relations expressing the conservation of mass, momentum, and energy. The Rankine-Hugoniot equations are not in themselves adequate to uniquely determine the parameters; therefore, additional knowledge of a material's behavior is necessary. This additional knowledge is given by the Hugoniot of a material which defines all pressure-volume states obtainable through a shock transition.

The Hugoniots included in this report represent data accumulated from various sources and are reduced to a form usable in existing computer codes for predicting material response to shock loading at pressures in and above the elastic region of a material. The purpose of this report is therefore to present the results of various investigations on materials of interest in a form which condenses the needed computer code inputs to an easily accessible source.

SECTION II

HUGONIOT DATA REPRESENTATION

1. FORM OF THE EQUATION OF STATE

The Mie-Gruneisen compressional equation of state can be written as

$$P - P_H\left(V_H\right) = \frac{\Gamma(v)}{V} \cdot \left(E - E_H\left(V_H\right)\right) \tag{1}$$

relating pressure-volume-energy through use of a reference curve, generally chosen as the Hugoniot. In the above equation, P, V, E refer to any equilibrium position admissible in a complete equation of state; P_H, V_H, E_H refer to states existing on the Hugoniot, and $\Gamma(v)$, the Gruneisen coefficient, is assumed to be a function of volume only.

The Hugoniot of a material defines all pressure-volume states obtainable through a shock transition and can be represented in the form

$$P_H = C\mu + D\mu^2 + S\mu^3 \tag{2}$$

where C, D, S are constants, $\mu = \rho/\rho_o - 1$, and ρ_o, ρ = initial and final densities, respectively.

A description of the Hugoniot in terms of measurable quantities can be obtained from the so-called "jump" conditions which are statements of conservation of mass, momentum, and energy across a shock front:

$$\rho_o U_s = \rho\left(U_s - U_p\right) \text{ conservation of mass} \tag{3}$$

$$P - P_o = \rho_o U_s U_p \text{ conservation of momentum} \tag{4}$$

$$P U_p = 1/2\ \rho_o U_s U_p^2 + \rho_o U_s \left(E - E_o\right) \text{ conservation of energy} \tag{5}$$

where

ρ = density

U_s, U_p = shock velocity, particle velocity, respectively

P = pressure

E = energy

and the subscript, o, refers to the undisturbed states.

By combining equations (3), (4), and (5), the Rankine-Hugoniot equation is obtained relating energy to pressure and volume on the Hugoniot curve

$$E_H - E_o = 1/2 \left(P_H + P_O\right) \left(V_O - V_H\right) \tag{6}$$

Combining equations (1), (2), and (6),

$$P = P_H\left(V_H\right) \cdot \left(1 - \frac{\Gamma(v)\rho}{2}\right) + \Gamma(v) \cdot \rho \cdot \left(E - E_o\right) \tag{7}$$

In PUFF-type codes $\Gamma(v)$ is assumed to be a constant, and E_o is set to zero. Equation (7) then becomes

$$P = \left(C\mu + D\mu^2 + S\mu^3\right) \cdot \left(1 - \frac{\Gamma\mu}{2}\right) + \Gamma\rho E \tag{8}$$

This, then, is a general equation of state used to describe material response under dynamic loading.

2. EXPERIMENTAL DETERMINATION OF THE HUGONIOT

The above equations, however, are not sufficient to establish an equation of state for a material without experimental data. This additional information is generated through experimental measurements of the Hugoniot. Several forms of Hugoniot data are used of which two will be considered here.

We have seen that one form of the Hugoniot is $P_H = C\mu + D\mu^2 + S\mu^3$. From equation (3) we see that

$$\rho/\rho_o = \left(\frac{U_s}{U_s - U_p}\right)$$

and from equation (4), if any two of the parameters P, U_s, or U_p can be measured, the third can be determined and a point on the Hugoniot can be found. A series of such measurements then defines equation (2)

Another form for the Hugoniot may be found by solving equations (3) and (4) for shock velocity and particle velocity.

$$U_s = \left[\left(\rho/\rho_o\right)\left(P - P_o\right)/\left(\rho - \rho_o\right)\right]^{1/2} \tag{9}$$

$$U_p = \left[\left(\rho - \rho_o\right)/\rho\right] U_s \tag{10}$$

If a simultaneous experimental determination of U_s and U_p is made, there is sufficient information to establish a point on the Hugoniot. A series of such measurements will then define the entire curve.

For most materials a linear relationship has been noted where

$$U_s = C_o + \lambda U_p \tag{11}$$

C_o = U_s intercept at zero pressure

λ = slope of shock/particle velocity data

This alternate form may also be used to represent Hugoniot data. C_o approximates the bulk sound speed given by

$$C_B^2 = C_L^2 - 4/3\ C_S^2$$

where

C_L = longitudinal sound speed

C_S = transverse sound speed

When U_s and U_p are linearly related, equation (2) can be written explicitly in terms of C_o and λ. If equations (11) and (4) are combined and P_o is negligibly small compared to P, then

$$P = \rho_o U_p \left(C_o + \lambda U_p\right) \tag{12}$$

Equation (10) can be written in the form

$$\rho_o/\rho = 1 - \left[U_p/\left(C_o + \lambda U_p\right)\right] \tag{13}$$

Eliminating U_p between equations (12) and (13),

$$P = \frac{\rho_o C_o^2 \mu(\mu + 1)}{\left[1 + \mu (1 - \lambda)\right]^2} \tag{14}$$

where $\mu = \rho/\rho_o - 1$. This then gives the user two forms of the Hugoniot representation. One form gives a least squares fit to the data points reported in the form

$$P_H = C\mu + D\mu^2 + S\mu^3$$

The second form is the relationship

$$U_s = C_o + \lambda U_p$$

SECTION III

MATERIAL PROPERTIES

1. DISCUSSION OF MATERIAL STRENGTH

The analytic functions for the Hugoniot so far discussed describe a material's hydrostatic behavior. In some cases this hydrodynamic treatment is a good approximation in the pressure regions of interest. For strong materials with high elastic moduli it is necessary to include elastic response in the calculations. In this treatment the Von Mises yield criterion is used to describe an elastic region which, when exceeded, results in plastic or hydrodynamic response of the material.

In figure 1 the Hugoniot elastic limit (HEL) of a material is the elastic limit in stress-strain space. The stress-strain curve is taken to lie above the hydrostat by a value equal to 2/3 Y_o, where Y_o is the yield strength in simple tension. In this report the Hugoniot elastic limit is found by either of two methods. In the first case the HEL is observed directly by noting the amplitude of the elastic precursor in a shock wave experiment when a material is stressed above its elastic limit.

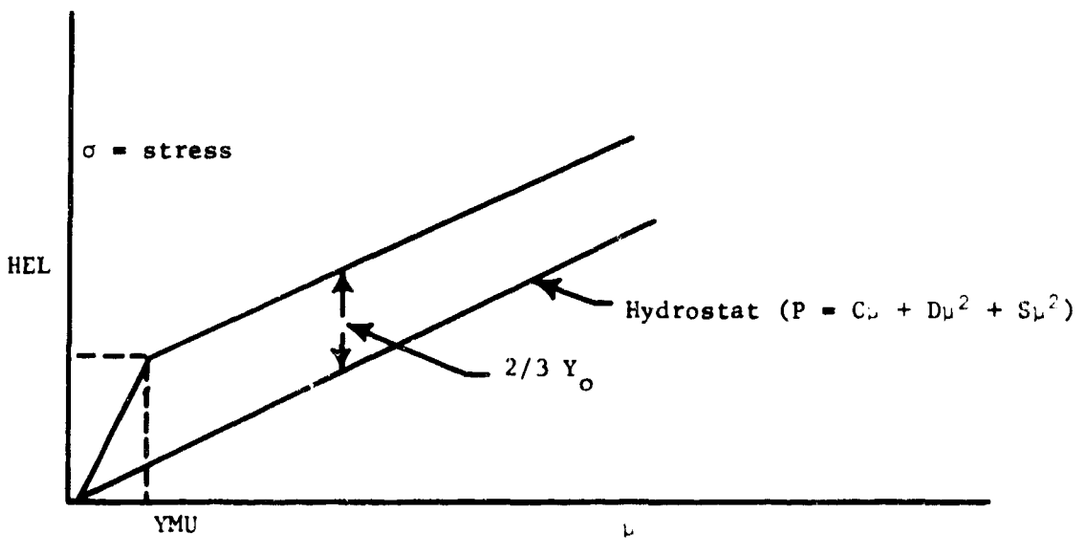

Figure 1. Typical Stress-Strain Curve

In the second case an estimate of the HEL may be calculated from Y_o and the elastic modulus. The elastic modulus is the slope of the stress-strain curve in the elastic region given by

$$\rho_o C_B^2 + 4/3\ \rho_o C_S^2$$

where

$\rho_o C_B^2$ = bulk modulus

$\rho_o C_S^2$ = shear modulus

The Hugoniot elastic limit is then

$$HEL = \left(\rho_o C_B^2 + 4/3\ \rho_o C_S^2\right) \cdot YMU$$

where YMU is the value of μ at the elastic limit. Since the Von Mises yield criterion offsets the stress-strain curve from the hydrostat by 2/3 Y_o,

$$HEL = \rho_o C_B^2 \cdot YMU + 2/3\ Y_o$$

and

$$YMU = (1/2)\ Y_c/\rho_o C_S^2$$

If $U_s - U_p$ data are available, a hydrostatic pressure is calculated using equation (14) and the value 2/3 Y_o is added to the calculated hydrostat. Should the experimental points still diverge from the predicted stress, a purely empirical work hardening term, YADD, is calculated to give a final fit:

$$P = C\mu + D\mu^2 + S\mu^3 + 2/3\ Y_o + 2/3 \left(\frac{\mu - YMU}{0.2 - YMU}\right) \cdot YADD$$

Work hardening is assumed to be a linear function of the strain and YADD is its value at $\mu = 0.2$. P is now a stress term taking into account material strength and work hardening properties.

2. SIGNIFICANCE OF THE $U_s - U_p$ RELATIONSHIP

As has been noted, the Hugoniots of many materials can be represented by a linear $U_s - U_p$ relationship, $U_s = C_o + \lambda U_p$.

Departures from linearity can usually be traced to porosity, material strength properties, or phase transitions. Phase transitions, for example, whose effect may be difficult to observe in the p-v plane are quite noticeable in the $U_s - U_p$ plane.

Since the constant term, C_o, can be determined by direct measurement of the acoustic wave velocities in an isotropic medium, the zero particle velocity intercept may then be used to fit the data. Thus, the Hugoniot equation of state of many materials may be described by ρ_o, C_o, and λ. As has been previously discussed, use of the yield strength, Y_o, and a work hardening term, YADD, improve the accuracy of the curve fit.

In some cases an adequate fit to the stress-strain data cannot be achieved using equation (14) and a $U_s - U_p$ relationship. Several reasons for this discrepancy should be noted. In low pressure regions, material strength properties tend to invalidate the use of equation (14). Also for some materials the $U_s - U_p$ relationship is not linear and has not been treated in this report.

For such cases a simple least square fit can be calculated for stress versus compression. In all cases the linear term is the bulk modulus. Since a least squares fit to the stress-μ data is used, in these cases it is not applicable to calculate a YADD.

All table data are explained under the section on symbols and units.

Table I

MATERIAL IMPEDANCES

Material	ρ_o	C_o	Impedance ($Z = \rho_o C_o$)
Aluminum	2.7	0.544	1.469
Aluminum (1060)	2.703	0.524	1.416
Aluminum (6061-T6)	2.704	0.521	1.409
24ST Aluminum	2.785	0.5375	1.497
921 T Aluminum	2.828	0.5038	1.425
Aluminum (2024)	2.785	0.525	1.462
Antimony	6.6	0.2167	1.430
Avcoat II	1.1	0.1919	0.211
Beryllium	1.851	0.8078	1.495
Bismuth	9.79	0.132	1.292
Boron Nitride	2.142	0.255	0.546
Brass	8.45	0.3784	3.197
Cadmium	8.64	0.2465	2.130
Boron Carbide	1.92	0.2951	0.567
Silicon Carbide	2.32	0.285	0.661
Tungsten Carbide	15.02	0.5181	7.782
Carbon Phenolic	1.49	0.42	0.626
3-D Carbon Phenolic	1.34	0.3	0.402
Chromium	7.12	0.5295	3.77
Cobalt	8.82	0.48	4.23
Copper	8.93	0.392	3.501
Durite	1.38	0.2847	0.393
Epoxy	1.2	0.267	0.32
C-7 Epoxy	1.2	0.265	0.318

Table I (cont'd)

Material	ρ_o	C_o	Impedance $(Z = \rho_o C_o)$
Exon	1.681	0.1948	0.327
Hi-D Glass	6.2	0.3	1.86
Gold	19.24	0.3147	6.055
Graphite Commercial	1.628	0.1477	0.240
Pyrolytic Graphite	2.2	0.4145	0.912
Hafnium	13.31	0.295	3.926
Armco Iron	7.85	0.45	3.533
Iron (Same as Armco)			
Lead	11.355	0.21	2.385
Lucite	1.181	0.2188	0.258
Magnesium	1.745	0.4545	0.793
Manganin	8.46	0.3803	3.217
Molybdenum	10.2	0.5163	5.266
Mylar	1.39	0.22	0.306
Nickel	8.86	0.4652	4.122
Niobium	8.58	0.4438	3.808
Nylon	1.14	0.2158	0.246
Palladium	11.95	0.3742	4.472
Paraffin	0.918	0.2968	0.272
AVCO Phenolic Fiberglass	1.9	0.1713	0.325
GE Phenolic Fiberglass	1.94	0.3276	0.636
Chopped Nylon Phenolic	1.21	0.2377	0.288
Tape-Wound Nylon Phenolic	1.22	0.3196	0.390
Quartz Phenolic	1.8	0.3156	0.568
3-D Quartz Phenolic	1.65	0.32	0.528

Table I (cont'd)

Material	ρ_o	C_o	Impedance $Z = \rho_o C_o$
X-Cut Crystalline Quartz	2.65	0.5728	1.518
Phenolic Refrasil	1.65	0.3007	0.496
Platinum	21.37	0.3636	7.770
Plexiglas	1.186	0.2745	0.326
Polyethylene	0.92	0.2931	0.270
Polystyrene	1.05	0.299	0.314
Polyurethane	1.265	0.207	0.262
RAD 58B	1.26	0.1202	0.151
OTWR	1.66	0.317	0.526
Series 124 Resin	1.22	0.2259	0.276
Silver	10.49	0.3305	3.467
Stainless Steel Type 304	7.896	0.4557	3.598
Stainless Steel Type 304L	7.903	0.4567	3.609
Steel, Mild EN3	7.84	0.3596	2.819
Tantalum	16.6	0.33	5.478
Teflon	2.16	0.1424	0.308
Thallium	11.84	0.1887	2.234
Thorium	11.68	0.2174	2.539
Tin	7.28	0.2575	1.875
Titanium	4.51	0.4695	2.117
Tungsten	19.17	0.397	7.610
TWSP	1.66	0.3614	0.600
Uranium-3 wt pct Molybdenum	18.45	0.2553	4.710
Vanadium	6.1	0.5072	3.094
Zinc	7.14	0.3051	2.178
Zirconium	6.505	0.3757	2.444

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SECTION IV

EQUATION OF STATE

DATA AND GRAPHS

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CUBIC FIT TO EQUATION OF STATE FOR ALUMINUM

RHO(0)= 2.70000

SUBLIMATION ENERGY= 1.17680E+11

GRUNEISEN COEF= 2.0900

AMU= 2.56133E-01(MB)

YO = 5.00000E-03(MB)

YMU= 9.76056E-03

HUGONIOT ELASTIC LIMIT = 1.11323E-02(MB)

CL= 6.260E-01(CM/MICROSEC)

CS= 3.080E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 2.550E-05

SPECIFIC HEAT(CP)= 8.960E+06

CB= 5.440E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.3274

IN THE ELASTIC WAVE C0= 1.14054

IN THE FIRST PLASTIC WAVE C1= .79903 * D1= 1.13927 S1= 1.39792

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.5800E-03	1.7134E-03	1.2003E-03	1.0015E+00	9.9850E-01	9.3690E-04	V/VO	9
2.4200E-03	2.6293E-03	1.8420E-03	1.0023E+00	9.9770E-01	1.4358E-03	V/VO	9
4.4200E-03	4.8105E-03	3.3701E-03	1.0042E+00	9.9580E-01	2.6221E-03	V/VO	9
6.3300E-03	6.8845E-03	4.8231E-03	1.0060E+00	9.9400E-01	3.7506E-03	V/VO	9
7.5900E-03	8.6187E-03	6.0380E-03	1.0076E+00	9.9250E-01	4.5917E-03	V/VO	9
9.5800E-03	1.1690E-02	8.3566E-03	1.0103E+00	9.8980E-01	6.0159E-03	V/VO	9
1.0010E-02	1.2195E-02	8.8613E-03	1.0109E+00	9.8920E-01	6.3277E-03	V/VO	9
1.1780E-02	1.3803E-02	1.0470E-02	1.0129E+00	9.8730E-01	7.4438E-03	V/VO	9
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1.4740E-02	1.7674E-02	1.4340E-02	1.0175E+00	9.8280E-01	9.6902E-03	V/VO	9
2.5290E-02	2.8620E-02	2.5287E-02	1.0303E+00	9.7060E-01	1.6595E-02	V/VO	9
3.1290E-02	3.6083E-02	3.2750E-02	1.0387E+00	9.6270E-01	2.0791E-02	V/VO	9
4.1200E-01	4.2141E-01	4.1807E-01	1.3200E+00	7.5760E-01	1.9232E-01	V/VO	10
5.4500E-01	5.5487E-01	5.5153E-01	1.3829E+00	7.2310E-01	2.3642E-01	V/VO	10
1.0420E+00	1.0301E+00	1.0268E+00	1.5530E+00	6.4390E-01	3.7071E-01	V/VO	8
1.0720E+00	1.0571E+00	1.0537E+00	1.5610E+00	6.4060E-01	3.7775E-01	V/VO	10
1.6000E+00	1.6047E+00	1.6014E+00	1.7010E+00	5.8790E-01	4.9417E-01	V/VO	10

* IMPLIES LINEAR TERM IS IMPOSED.

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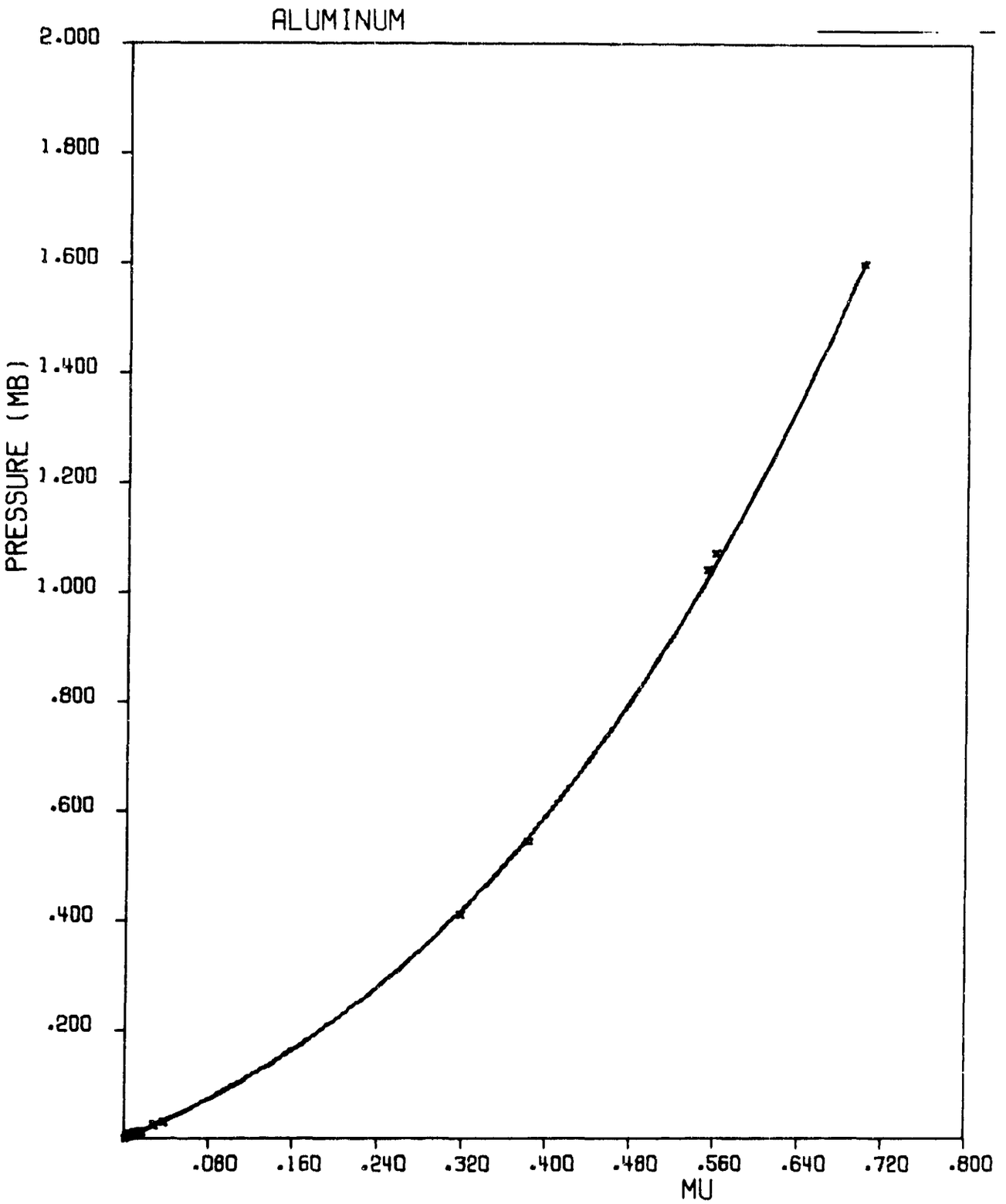
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2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.080
.160
.240
.320
.400
.480
.560
.640
.720
.800
MU

CUBIC FIT TO EQUATION OF STATE FOR ALUMINUM (1060)

RHO(0)= 2.70000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF= 2.0600

AMU= 2.73035E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 6.400E-01(CM/MICROSEC)

CS= 3.180E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 6.270E-05

SPECIFIC HEAT(CP)= 8.370E+06

CB= 5.240E-01(CM/MICROSEC)

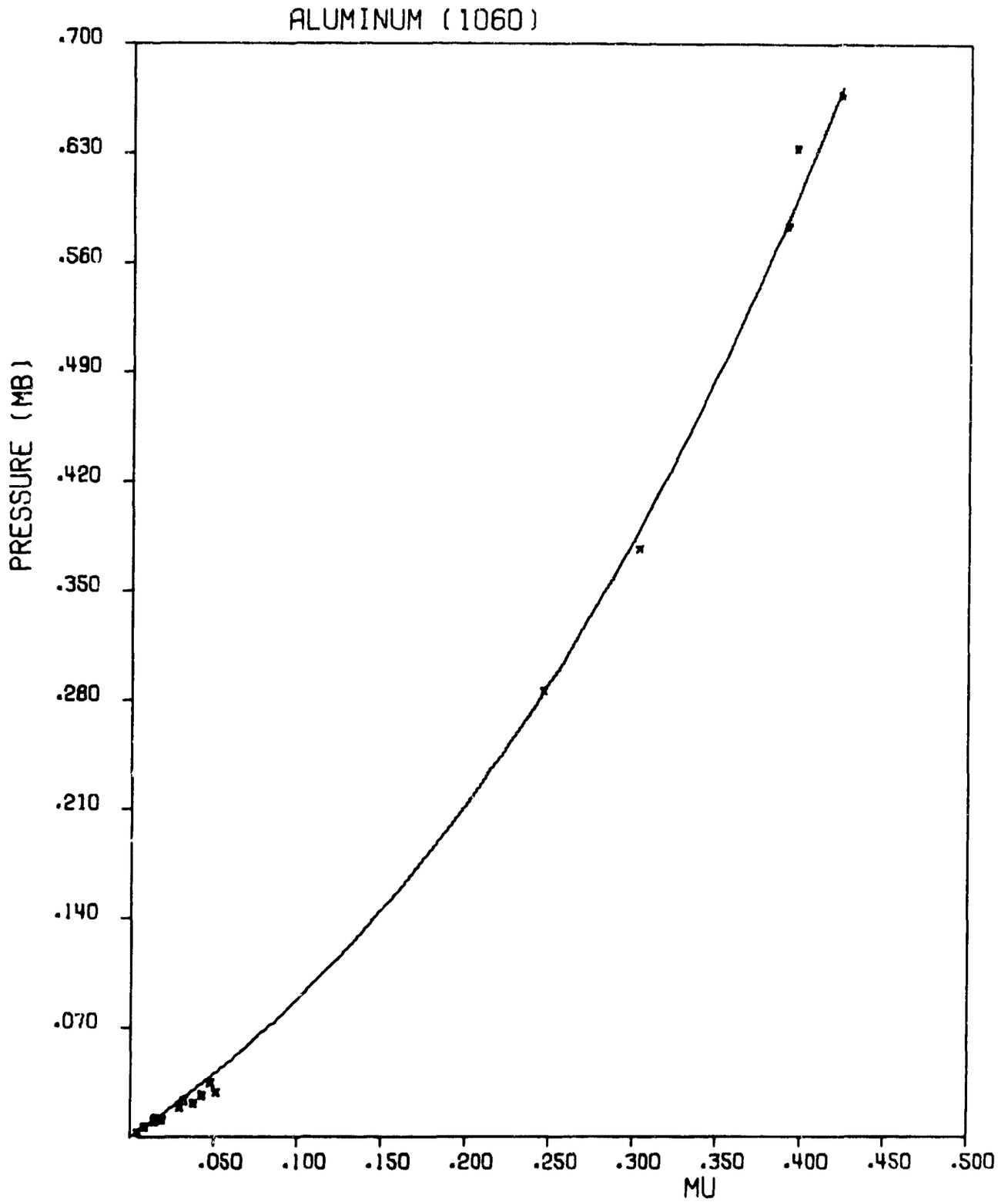
SLOPE OF US-UP= 1.4382

IN THE FIRST PLASTIC WAVE C1= .74136 * D1= 1.28107 S1= 1.70340

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
3.1100E-03	3.4375E-03	3.4375E-03	1.0046E+00	9.9542E-01	2.2966E-03	ETA	47
6.1400E-03	6.6243E-03	6.6243E-03	1.0088E+00	9.9128E-01	4.4539E-03	ETA	47
9.9400E-03	1.1024E-02	1.1024E-02	1.0145E+00	9.8571E-01	7.2539E-03	ETA	47
1.0540E-02	1.1102E-02	1.1102E-02	1.0146E+00	9.8561E-01	7.4949E-03	ETA	47
1.0620E-02	1.4956E-02	1.4956E-02	1.0195E+00	9.8087E-01	8.6737E-03	ETA	47
1.9200E-02	2.3193E-02	2.3193E-02	1.0297E+00	9.7116E-01	1.4322E-02	ETA	47
2.1050E-02	3.0199E-02	3.0199E-02	1.0381E+00	9.6330E-01	1.6916E-02	ETA	47
2.3260E-02	2.5257E-02	2.5257E-02	1.0322E+00	9.6880E-01	1.6393E-02	ETA	47
2.6390E-02	3.4124E-02	3.4124E-02	1.0427E+00	9.5905E-01	2.0007E-02	ETA	47
2.8520E-02	4.1367E-02	4.1367E-02	1.0510E+00	9.5147E-01	2.2640E-02	ETA	47
3.4610E-02	3.8550E-02	3.8550E-02	1.0478E+00	9.5438E-01	2.4182E-02	ETA	47
1.1780E-02	1.1727E-02	1.1727E-02	1.0154E+00	9.8483E-01	8.1345E-03	ETA	47
2.8600E-01	2.8526E-01	2.8526E-01	1.2460E+00	8.0257E-01	1.4461E-01	ETA	25
3.7700E-01	3.8963E-01	3.8963E-01	1.3030E+00	7.6746E-01	1.8019E-01	ETA	25
5.8300E-01	5.8754E-01	5.8754E-01	1.3910E+00	7.1891E-01	2.4636E-01	ETA	25
6.3300E-01	6.0025E-01	6.0025E-01	1.3960E+00	7.1633E-01	2.5788E-01	ETA	25
6.6700E-01	6.7174E-01	6.7174E-01	1.4230E+00	7.0274E-01	2.7099E-01	ETA	25

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 5.99496E-03(MB)


ALUMINUM (1060)
PRESSURE (MB)
.700
.630
.560
.490
.420
.350
.280
.210
.140
.070
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR ALUMINUM 6061-T6 (LOW PRESSURE)

RHO(0)= 2.70400

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF= 2.0300

AMU= 2.75162E-01(MB)

YO = 2.69948E-03(MB)

YHUG= 4.90526E-03

HUGONIOT ELASTIC LIMIT = 5.40000E-03(MB)

CL= 6.430E-01(CM/MICROSEC)

CS= 3.190E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 6.300E-05

SPECIFIC HEAT(CP)= 8.630E+06

CB= 5.210E-01(CM/MICROSEC)

SLOPE OF US-UP= -0.

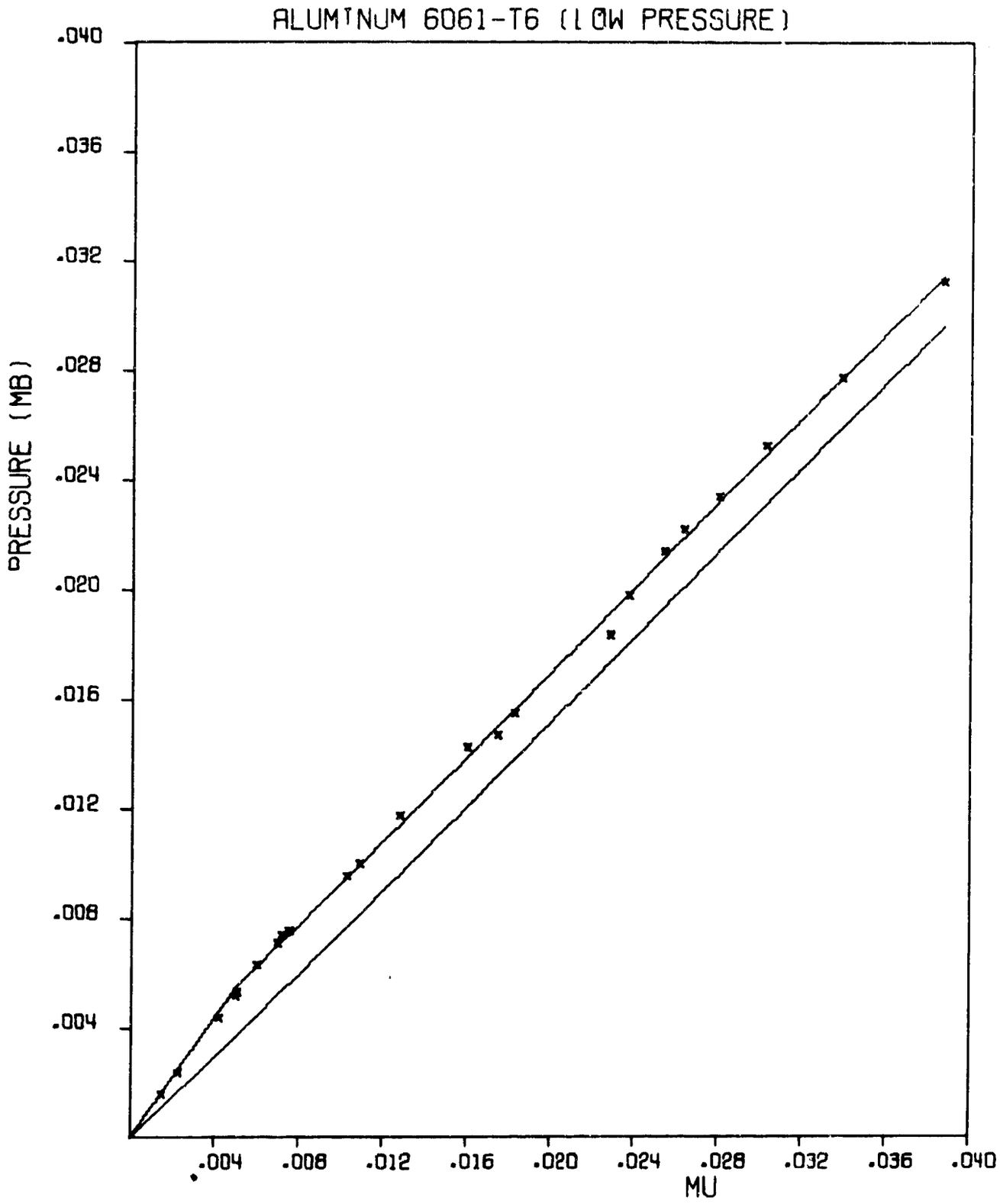
IN THE ELASTIC WAVE C0= 1.10086

IN THE FIRST PLASTIC WAVE C1= .73398 * D1= 1.85973 S1= -26.98235

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.6000E-03	1.6538E-03	1.1026E-03	1.0015E+00	9.9850E-01	9.4211E-04	V/VO	6
2.4000E-03	2.5378E-03	1.6920E-03	1.0023E+00	9.9770E-01	1.4288E-03	V/VO	6
4.4000E-03	4.6431E-03	3.0957E-03	1.0042E+00	9.9580E-01	2.6143E-03	V/VO	6
5.2000E-03	5.5315E-03	3.7319E-03	1.0050E+00	9.9500E-01	3.1009E-03	V/VO	6
5.3200E-03	5.6074E-03	3.8077E-03	1.0051E+00	9.9490E-01	3.1677E-03	V/VO	6
6.3300E-03	6.2919E-03	4.4923E-03	1.0060E+00	9.9400E-01	3.7478E-03	V/VO	6
7.1200E-03	7.0567E-03	5.2570E-03	1.0070E+00	9.9300E-01	4.2932E-03	V/VO	6
7.4300E-03	7.2101E-03	5.4105E-03	1.0073E+00	9.9280E-01	4.4479E-03	V/VO	6
7.5900E-03	7.4406E-03	5.6410E-03	1.0076E+00	9.9250E-01	4.5883E-03	V/VO	6
9.5800E-03	9.5313E-03	7.7317E-03	1.0103E+00	9.8980E-01	6.0115E-03	V/VO	6
1.0010E-02	9.9997E-03	8.2001E-03	1.0109E+00	9.8920E-01	6.3230E-03	V/VO	6
1.1780E-02	1.1491E-02	9.6917E-03	1.0129E+00	9.8730E-01	7.4383E-03	V/VO	6
1.4270E-02	1.3950E-02	1.2151E-02	1.0161E+00	9.8420E-01	9.1314E-03	V/VO	6
1.4740E-02	1.5070E-02	1.3270E-02	1.0175E+00	9.8280E-01	9.6830E-03	V/VO	6
1.5530E-02	1.5712E-02	1.3912E-02	1.0183E+00	9.8200E-01	1.0168E-02	V/VO	6
1.8370E-02	1.9188E-02	1.7388E-02	1.0228E+00	9.7770E-01	1.2308E-02	V/VO	6
1.9840E-02	1.9920E-02	1.8120E-02	1.0238E+00	9.7680E-01	1.3047E-02	V/VO	6
2.1420E-02	2.1224E-02	1.9424E-02	1.0254E+00	9.7520E-01	1.4016E-02	V/VO	6
2.2220E-02	2.1959E-02	2.0160E-02	1.0264E+00	9.7430E-01	1.4532E-02	V/VO	6
2.3450E-02	2.3268E-02	2.1468E-02	1.0281E+00	9.7270E-01	1.5387E-02	V/VO	6
2.5290E-02	2.4984E-02	2.3189E-02	1.0303E+00	9.7060E-01	1.6582E-02	V/VO	6
2.7790E-02	2.7777E-02	2.5977E-02	1.0339E+00	9.6720E-01	1.8360E-02	V/VO	6
3.1290E-02	3.1460E-02	2.9660E-02	1.0387E+00	9.6270E-01	2.0776E-02	V/VO	6

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 2.05420E-04(MB)


ALUMINUM 6061-T6 (LOW PRESSURE)
PRESSURE (MB)
.040
.036
.032
.028
.024
.020
.016
.012
.008
.004
.004
.008
.012
.016
.020
.024
.028
.032
.036
.040
MU

CUBIC FIT TO EQUATION OF STATE FOR AL 2024

RHO(0)= 2.78500

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF= 2.0000

AMU= 2.76342E-01(MB)

YO = 2.62703E-03(MB)

YMU= 4.75322E-03

HUGONIOT ELASTIC LIMIT = 5.40000E-03(MB)

CL= 6.390E-01(CM/MICROSEC)

CS= 3.150E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 6.280E-05

SPECIFIC HEAT(CP)= 9.000E+06

CB= 5.250E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.3718

IN THE ELASTIC WAVE C0= 1.13607

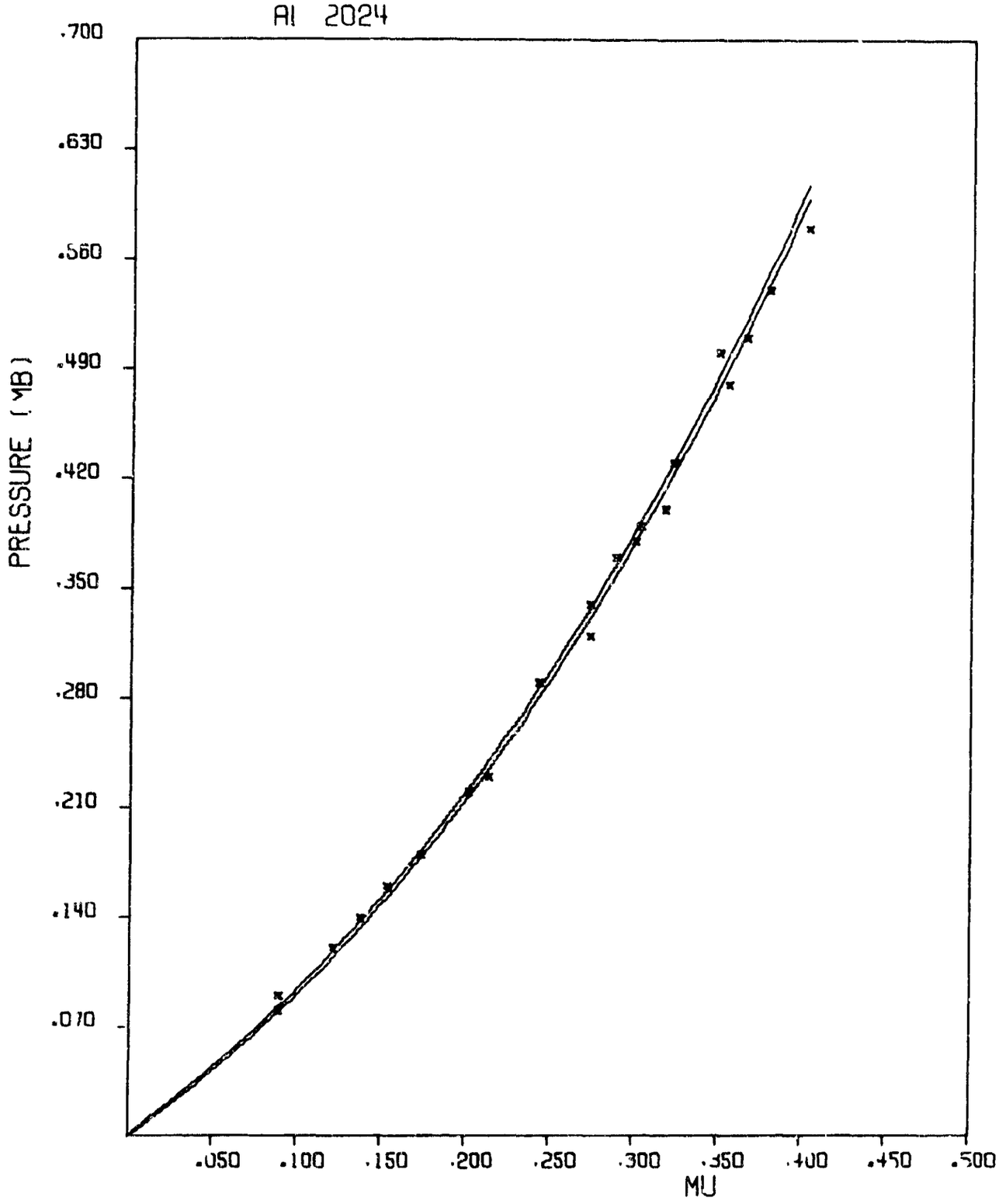
IN THE FIRST PLASTIC WAVE C1= .76762 * D1= 1.28312 S1= 1.25133

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
8.0000E-02	8.2927E-02	7.9697E-02	1.0893E+00	9.1800E-01	4.8533E-02	V/VO	20
9.0000E-02	8.2927E-02	7.9697E-02	1.0893E+00	9.1800E-01	5.1477E-02	V/VO	20
1.2000E-01	1.1921E-01	1.1540E-01	1.1223E+00	8.9100E-01	6.8532E-02	V/VO	20
1.4000E-01	1.3732E-01	1.3325E-01	1.1377E+00	8.7900E-01	7.7991E-02	V/VO	20
1.6000E-01	1.5682E-01	1.5247E-01	1.1534E+00	8.6700E-01	8.7412E-02	V/VO	20
1.8000E-01	1.7833E-01	1.7862E-01	1.1737E+00	8.5200E-01	9.7804E-02	V/VO	20
2.2000E-01	2.2282E-01	2.1762E-01	1.2019E+00	8.3200E-01	1.1520E-01	V/VO	20
2.3000E-01	2.4009E-01	2.3469E-01	1.2136E+00	8.2400E-01	1.2056E-01	V/VO	20
2.9000E-01	2.8745E-01	2.8151E-01	1.2438E+00	8.0400E-01	1.4286E-01	V/VO	20
3.2000E-01	3.3866E-01	3.3220E-01	1.2739E+00	7.8500E-01	1.5717E-01	V/VO	20
3.4000E-01	3.3866E-01	3.3220E-01	1.2739E+00	7.8500E-01	1.6201E-01	V/VO	20
3.7000E-01	3.6531E-01	3.5859E-01	1.2887E+00	7.7600E-01	1.7251E-01	V/VO	20
3.8000E-01	3.8721E-01	3.8028E-01	1.3004E+00	7.6900E-01	1.7754E-01	V/VO	20
3.9000E-01	3.9366E-01	3.8668E-01	1.3038E+00	7.6700E-01	1.8063E-01	V/VO	20
4.0000E-01	4.2038E-01	4.1316E-01	1.3175E+00	7.5900E-01	1.8605E-01	V/VO	20
4.3000E-01	4.3079E-01	4.2348E-01	1.3228E+00	7.5600E-01	1.9410E-01	V/VO	20
4.8000E-01	4.9810E-01	4.9022E-01	1.3550E+00	7.3800E-01	2.1250E-01	V/VO	20
5.0000E-01	4.8628E-01	4.7849E-01	1.3495E+00	7.4100E-01	2.1564E-01	V/VO	20
5.1000E-01	5.2252E-01	5.1444E-01	1.3661E+00	7.3200E-01	2.2153E-01	V/VO	20
5.4000E-01	5.5237E-01	5.4406E-01	1.3793E+00	7.2500E-01	2.3091E-01	V/VO	20
5.8000E-01	6.0720E-01	5.9849E-01	1.4025E+00	7.1300E-01	2.4448E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 7.36831E-03(MB)

YADD AT .2MU = 5.123E-03


Al 2024
.700
.630
.560
.490
.420
.350
.280
.210
.140
.070
PRESSURE (MB)
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR 24ST ALUMINUM

$R_H0(0)$= 2.78500

SUBLIMATION ENERGY= -0. *NO DATA

GRUNFISEN COEF= 2.1300

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 6.900E-05

SPECIFIC HEAT(CP)= 9.628E+06

CB= 5.375E-01(CM/MICROSEC)

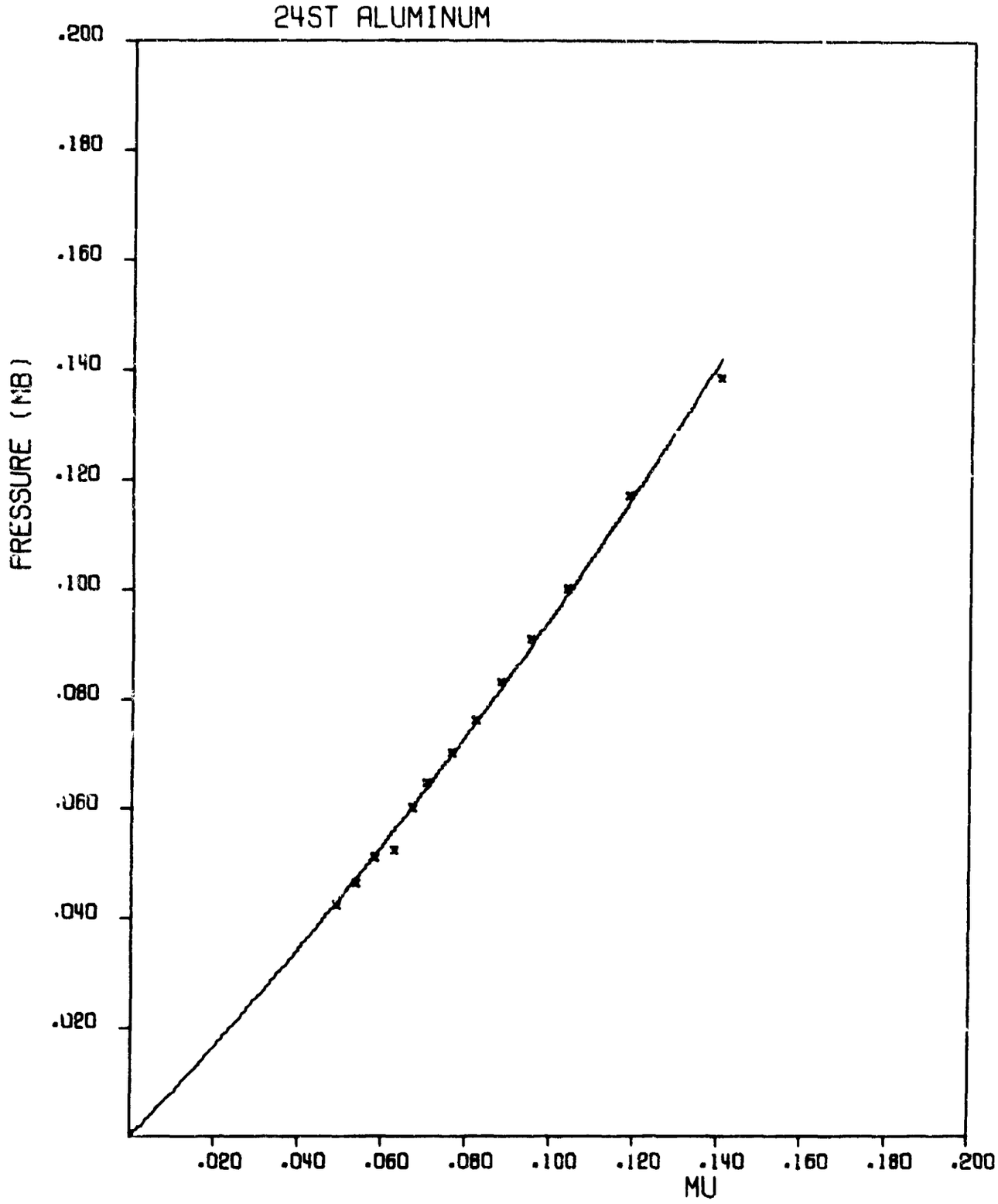
SLOPE OF US-UP= 1.3425

IN THE FIRST PLASTIC WAVE C1= .80460 * D1= 1.35121 S1= .92648

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
4.2270E-02	4.3079E-02	4.3079E-02	1.0493E+00	9.5300E-01	2.6709E-02	V/VO	19
4.6410E-02	4.7286E-02	4.7286E-02	1.0537E+00	9.4900E-01	2.9153E-02	V/VO	19
5.1040E-02	5.1589E-02	5.1589E-02	1.0582E+00	9.4500E-01	3.1749E-02	V/VO	19
5.2320E-02	5.5988E-02	5.5988E-02	1.0627E+00	9.4100E-01	3.3293E-02	V/VO	19
6.0120E-02	6.0488E-02	6.0488E-02	1.0672E+00	9.3700E-01	3.6878E-02	V/VO	19
6.4750E-02	6.3930E-02	6.3930E-02	1.0707E+00	9.3400E-01	3.9172E-02	V/VO	19
7.0050E-02	6.9799E-02	6.9799E-02	1.0764E+00	9.2900E-01	4.2259E-02	V/VO	19
7.6110E-02	7.5836E-02	7.5836E-02	1.0823E+00	9.2400E-01	4.5574E-02	V/VO	19
8.3210E-02	8.2049E-02	8.2049E-02	1.0881E+00	9.1900E-01	4.9195E-02	V/VO	19
9.0770E-02	8.9742E-02	8.9742E-02	1.0953E+00	9.1300E-01	5.3250E-02	V/VO	19
1.0010E-01	9.9060E-02	9.9060E-02	1.1038E+00	9.0600E-01	5.8126E-02	V/VO	19
1.1720E-01	1.1594E-01	1.1594E-01	1.1186E+00	8.9400E-01	6.6789E-02	V/VO	19
1.3860E-01	1.4198E-01	1.4198E-01	1.1403E+00	8.7700E-01	7.9239E-02	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.19113E-03(MB)


24ST ALUMINUM
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
PRESSURE (MB)
.020
.040
.060
.080
.100
.120
.140
.160
.180
.200
MU

CUBIC FIT TO EQUATION OF STATE FOR 921 T ALUMINUM

RHO(1)= 2.72300

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF= 2.1000

APU= 2.78429E-01 (MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 6.340E-01(CM/MICROSEC)

CS= 3.140E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 8.700E-06

SPECIFIC HEAT(CP)= 3.670E+07

CB= 5.038E-01(CM/MICROSEC)

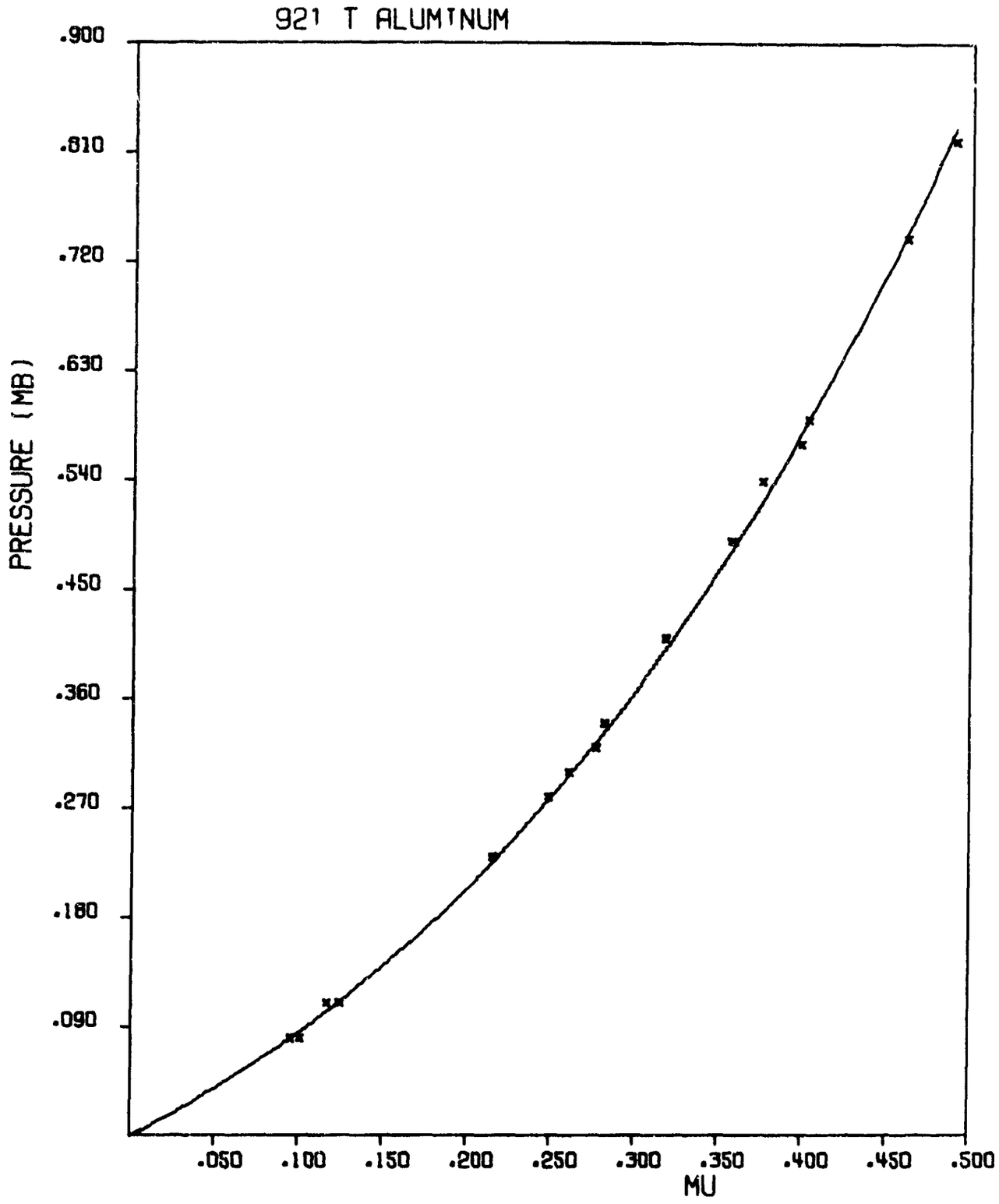
SLOPE OF US-UP= 1.4198

IN THE FIRST PLASTIC WAVE C1= .71779 * D1= 1.19426 S1= 1.62039

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
8.0000E-02	8.0644E-02	8.0644E-02	1.0953E+00	9.1300E-01	4.9610E-02	V/VO	20
8.0000E-02	8.6673E-02	8.6673E-02	1.1013E+00	9.0800E-01	5.1015E-02	V/VO	20
1.1000E-01	1.0326E-01	1.0324E-01	1.1173E+00	8.9500E-01	6.3907E-02	V/VO	20
1.1000E-01	1.1140E-01	1.1140E-01	1.1249E+00	8.8900E-01	6.5708E-02	V/VO	20
2.3000E-01	2.2573E-01	2.2573E-01	1.2151E+00	8.2300E-01	1.1998E-01	V/VO	20
2.8000E-01	2.7689E-01	2.7689E-01	1.2484E+00	8.0100E-01	1.4037E-01	V/VO	20
3.0000E-01	2.9756E-01	2.9756E-01	1.2610E+00	7.9300E-01	1.4819E-01	V/VO	20
3.2000E-01	3.2515E-01	3.2515E-01	1.2771E+00	7.8300E-01	1.5670E-01	V/VO	20
3.4000E-01	3.3382E-01	3.3382E-01	1.2821E+00	7.8000E-01	1.6263E-01	V/VO	20
3.4000E-01	3.3382E-01	3.3382E-01	1.2821E+00	7.8000E-01	1.6263E-01	V/VO	20
4.1000E-01	4.0019E-01	4.0019E-01	1.3175E+00	7.5900E-01	1.8697E-01	V/VO	20
4.9000E-01	4.8591E-01	4.8591E-01	1.3587E+00	7.3600E-01	2.1388E-01	V/VO	20
4.9000E-01	4.8186E-01	4.8186E-01	1.3569E+00	7.3700E-01	2.1347E-01	V/VO	20
5.4000E-01	5.2375E-01	5.2375E-01	1.3755E+00	7.2700E-01	2.2832E-01	V/VO	20
5.7000E-01	5.7848E-01	5.7848E-01	1.3986E+00	7.1500E-01	2.3967E-01	V/VO	20
5.9000E-01	5.8811E-01	5.8811E-01	1.4025E+00	7.1300E-01	2.4470E-01	V/VO	20
7.4000E-01	7.4624E-01	7.4624E-01	1.4620E+00	6.8400E-01	2.8755E-01	V/VO	20
8.2000E-01	8.3005E-01	8.3005E-01	1.4903E+00	6.7100E-01	3.0886E-01	V/VO	20
8.2000E-01	8.3005E-01	8.3005E-01	1.4903E+00	6.7100E-01	3.0886E-01	V/VO	20

* IMPLIES LINEAR FIT IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 6.20118E-03(MB)


921 T ALUMINUM
.900
.810
.720
.630
.540
.450
.360
.270
.180
.090
PRESSURE (MB)
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR ANTIMONY

RHO(0)= 6.60000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF= .8012

AMU= 0. (MB) *NO DATA

YO = 1.07500E-04(MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 3.600E-05

SPECIFIC HEAT(CP)= 2.110E+06

CB= 2.167E-01(CM/MICROSEC)

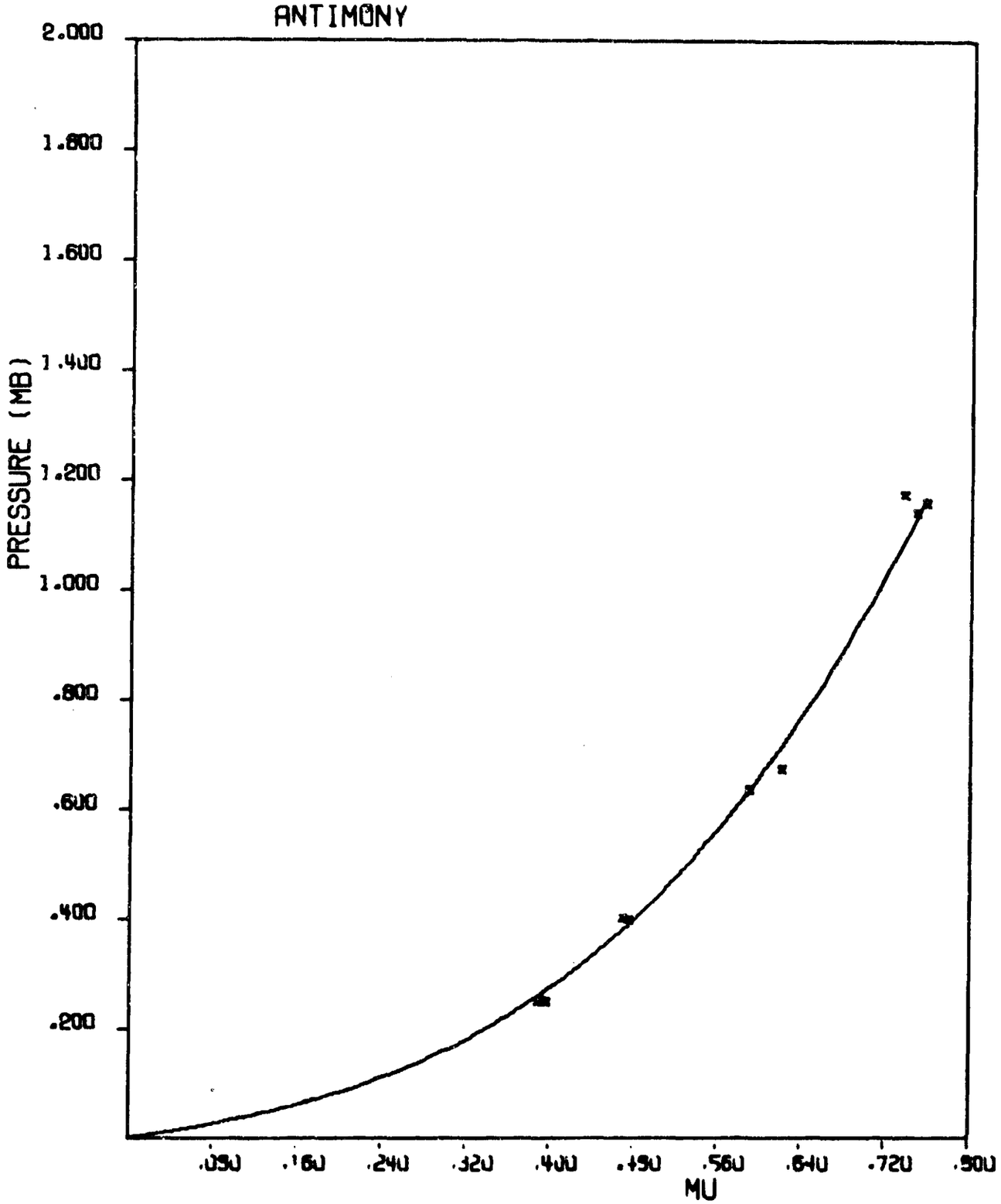
SLOPE OF US-UP= 1.5384

IN THE FIRST PLASTIC WAVE C1= .30993 * D1= .17235 S1= 1.91958

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.4800E-01	2.6991E-01	2.6984E-01	1.3966E+00	7.1600E-01	1.0330E-01	V/VO	19
2.4900E-01	2.5956E-01	2.5949E-01	1.3889E+00	7.2000E-01	1.0278E-01	V/VO	19
4.0000E-01	3.9177E-01	3.9170E-01	1.4749E+00	6.7800E-01	1.3970E-01	V/VO	19
4.0100E-01	3.8037E-01	3.8030E-01	1.4684E+00	6.8100E-01	1.3922E-01	V/VO	19
6.3700E-01	6.3672E-01	6.3665E-01	1.5898E+00	6.2900E-01	1.8923E-01	V/VO	19
6.7300E-01	7.1801E-01	7.1794E-01	1.6207E+00	6.1700E-01	1.9762E-01	V/VO	19
1.1420E+00	1.1326E+00	1.1326E+00	1.7483E+00	5.7200E-01	2.7213E-01	V/VO	19
1.1580E+00	1.1680E+00	1.1679E+00	1.7575E+00	5.6900E-01	2.7499E-01	V/VO	19
1.1750E+00	1.0873E+00	1.0872E+00	1.7361E+00	5.7600E-01	2.7475E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 2.37435E-02(MB)


ANTIMONY
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.080
.160
.240
.320
.400
.480
.560
.640
.720
.800
MU

CUBIC FIT TO EQUATION OF STATE FOR AVCOAT II

RHO(0)= 1.10000

SUBLIMATION ENERGY= -0. *NO DATA

CL= 2.250E-01(CM/MICROSEC)

GRUNFISEN COEF= 1.1469

CS= 9.200E-02(CM/MICROSEC)

AMU= 9.31040E-03(MB)

THERMAL COEF OF EXPANSION(VOL)= 3.102E-04

YO =-0. (MB)

SPECIFIC HEAT(CP)= 9.960E+06

YMU= 0.

CB= 1.919E-01(CM/MICROSEC)

HUGONIOT ELASTIC LIMIT =-0. (MB)

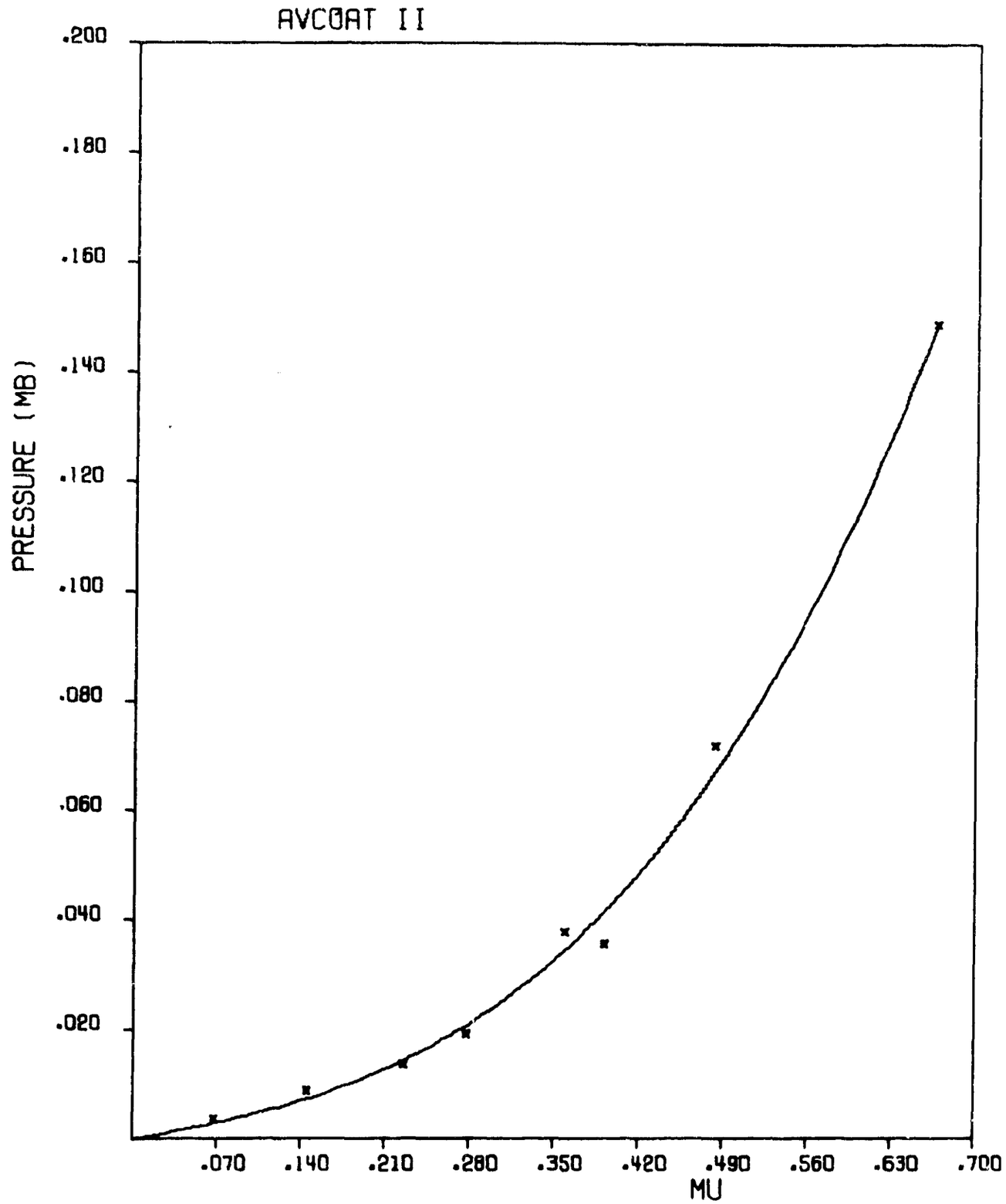
SLOPE OF US-UP= 1.6789

IN THE FIRST PLASTIC WAVE C1= .04051 * D1= .01617 S1= .38728

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
3.6900E-03	2.9511E-03	2.9511E-03	1.0680E+00	9.3633E-01	1.4615E-02	ETA	45
8.8600E-03	7.3943E-03	7.3943E-03	1.1450E+00	8.7336E-01	3.1938E-02	ETA	45
3.7900E-02	3.4545E-02	3.4545E-02	1.3590E+00	7.3564E-01	9.5403E-02	ETA	45
1.3600E-02	1.4451E-02	1.4451E-02	1.2260E+00	8.1566E-01	4.7740E-02	ETA	30
1.9100E-02	2.0692E-02	2.0692E-02	1.2770E+00	7.8309E-01	6.1371E-02	ETA	30
3.5600E-02	4.1461E-02	4.1461E-02	1.3910E+00	7.1891E-01	9.5379E-02	ETA	30
7.1900E-02	6.7303E-02	6.7303E-02	1.4840E+00	6.7385E-01	1.4601E-01	ETA	30
1.4900E-01	1.4913E-01	1.4913E-01	1.6670E+00	5.9988E-01	2.3280E-01	ETA	30

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 2.32424E-03(MB)


AVCOAT II
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
PRESSURE (MB)
.070
.140
.210
.280
.350
.420
.490
.560
.630
.700
MU

CUBIC FIT TO EQUATION OF STATE FOR BERYLLIUM

RHO(0)= 1.85100

SUBLIMATION ENERGY= 3.54900E+11

GRUNEISEN COEF= 1.4505

AMU= 1.45959E+00(MB)

YO = 3.10300E-03(MB)

YMU= 1.06297E-03

HUGONIOT ELASTIC LIMIT = 3.35257E-03(MB)

CL= 1.289E+00(CM/MICROSEC)

CS= 8.880E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 3.690E-05

SPECIFIC HEAT(CP)= 1.660E+07

CB= 8.078E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.1373

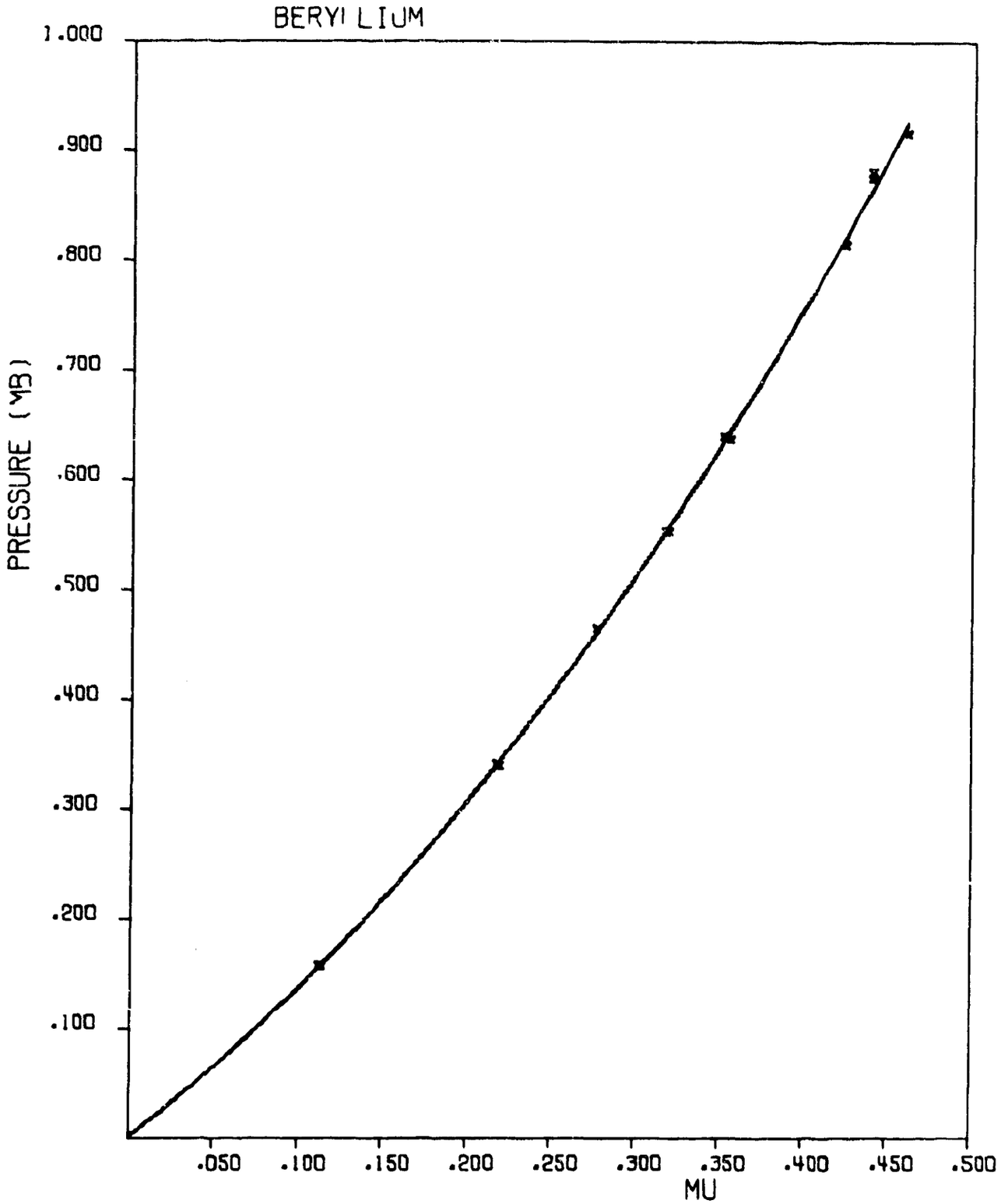
IN THE ELASTIC WAVE C0= 3.15398

IN THE FIRST PLASTIC WAVE C1= 1.20785 * D1= 1.52886 S1= .46255

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.5760E-01	1.5967E-01	1.5760E-01	1.1136E+00	8.9800E-01	9.3191E-02	V/VO	17
1.5810E-01	1.5869E-01	1.5662E-01	1.1130E+00	8.9850E-01	9.3110E-02	V/VO	17
3.4080E-01	3.4606E-01	3.4399E-01	1.2197E+00	8.1990E-01	1.8210E-01	V/VO	17
3.4100E-01	3.4461E-01	3.4254E-01	1.2189E+00	8.2040E-01	1.8190E-01	V/VO	17
3.4140E-01	3.4346E-01	3.4139E-01	1.2183E+00	8.2080E-01	1.8180E-01	V/VO	17
4.6520E-01	4.6444E-01	4.6237E-01	1.2773E+00	7.8290E-01	2.3359E-01	V/VO	17
5.5390E-01	5.5858E-01	5.5651E-01	1.3193E+00	7.5800E-01	2.6910E-01	V/VO	17
5.5460E-01	5.5575E-01	5.5368E-01	1.3180E+00	7.5870E-01	2.6888E-01	V/VO	17
6.3780E-01	6.4789E-01	6.4582E-01	1.3565E+00	7.3720E-01	3.0092E-01	V/VO	17
6.4050E-01	6.3659E-01	6.3452E-01	1.3519E+00	7.3970E-01	3.0012E-01	V/VO	17
8.1500E-01	8.2457E-01	8.2250E-01	1.4241E+00	7.0220E-01	3.6211E-01	V/VO	17
8.1510E-01	8.2346E-01	8.2139E-01	1.4237E+00	7.0240E-01	3.6201E-01	V/VO	17
8.7510E-01	8.6742E-01	8.6535E-01	1.4395E+00	6.9470E-01	3.7992E-01	V/VO	17
8.8230E-01	8.6859E-01	8.6652E-01	1.4399E+00	6.9450E-01	3.8160E-01	V/VO	17
9.1670E-01	9.2703E-01	9.2496E-01	1.4603E+00	6.8480E-01	3.9510E-01	V/VO	17

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 5.58816E-03(MB)


BERYLLIUM
1.000
.900
.800
.700
.600
.500
.400
.300
.200
.100
PRESSURE (MB)
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR BISMUTH

RHO(0)= 9.79000

SUBLIMATION ENERGY= 9.21700E+09 CL= 2.180E-01(CM/MICROSEC)

GRUNEISEN COEF= 1.9600 CS= 1.100E-01(CM/MICROSEC)

AMU= 1.13459E-01(IN) THERMAL COEF OF EXPANSION(VOL)= 4.000E-05

YO =-0. (IN) SPECIFIC HEAT(CP)= 1.226E+07

YMU= 0. CB= 1.320E-01(CM/MICROSEC)

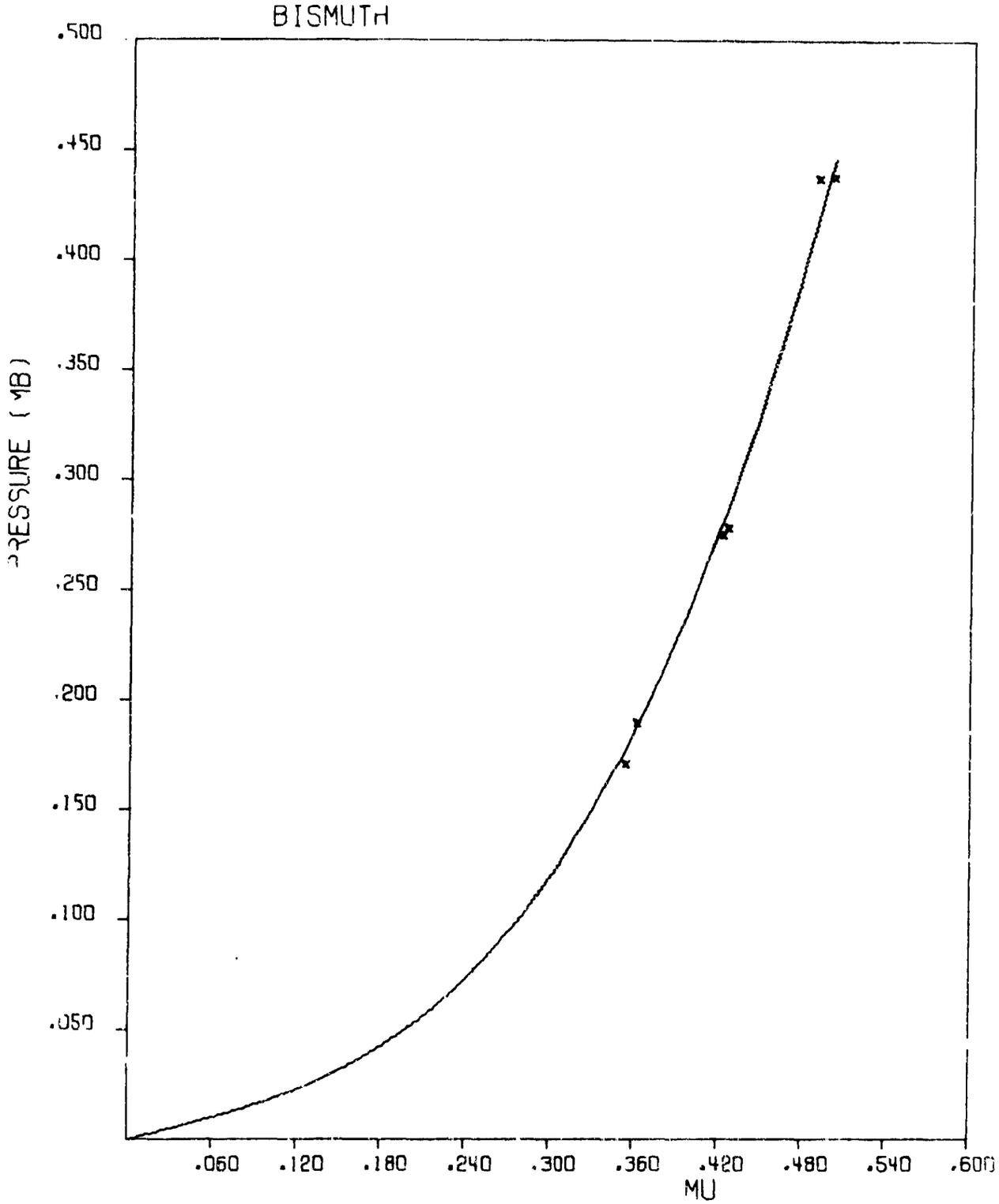
HUGONIOT ELASTIC LIMIT =-0. (MB) SLOPE OF US-UP= 1.9276

IN THE FIRST PLASTIC WAVE C1= .1705A * D1= -.24065 S1= 3.33901

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.8950E-01	1.8986E-01	1.8986E-01	1.3630E+00	7.3370E-01	7.1796E-02	V/VO	13
1.7110E-01	1.7847E-01	1.7847E-01	1.3541E+00	7.3850E-01	6.7604E-02	V/VO	13
2.7520E-01	2.8161E-01	2.8161E-01	1.4229E+00	7.0280E-01	9.1402E-02	V/VO	13
2.7840E-01	2.8838E-01	2.8808E-01	1.4265E+00	7.0100E-01	9.2210E-02	V/VO	13
4.3690E-01	4.2041E-01	4.2041E-01	1.4908E+00	6.7080E-01	1.2121E-01	V/VO	13
4.3770E-01	4.4617E-01	4.4617E-01	1.5015E+00	6.6600E-01	1.2220E-01	V/VO	13

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 8.13088E-03(MB)


BISMUTH
.500
.450
.400
.350
.300
.250
.200
.150
.100
.050
PRESSURE (MB)
.060
.120
.180
.240
.300
.360
.420
.480
.540
.600
MU

CUBIC FIT TO EQUATION OF STATE FOR BORON NITRIDE (LOW PRESSURE)

RHO(0)= 2.14200

SUBLIMATION ENERGY= 2.70200E+11

GRUNEISEN COEF=-0. *NO DATA

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 1.000E-04

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 2.550E-01(CM/MICROSEC)

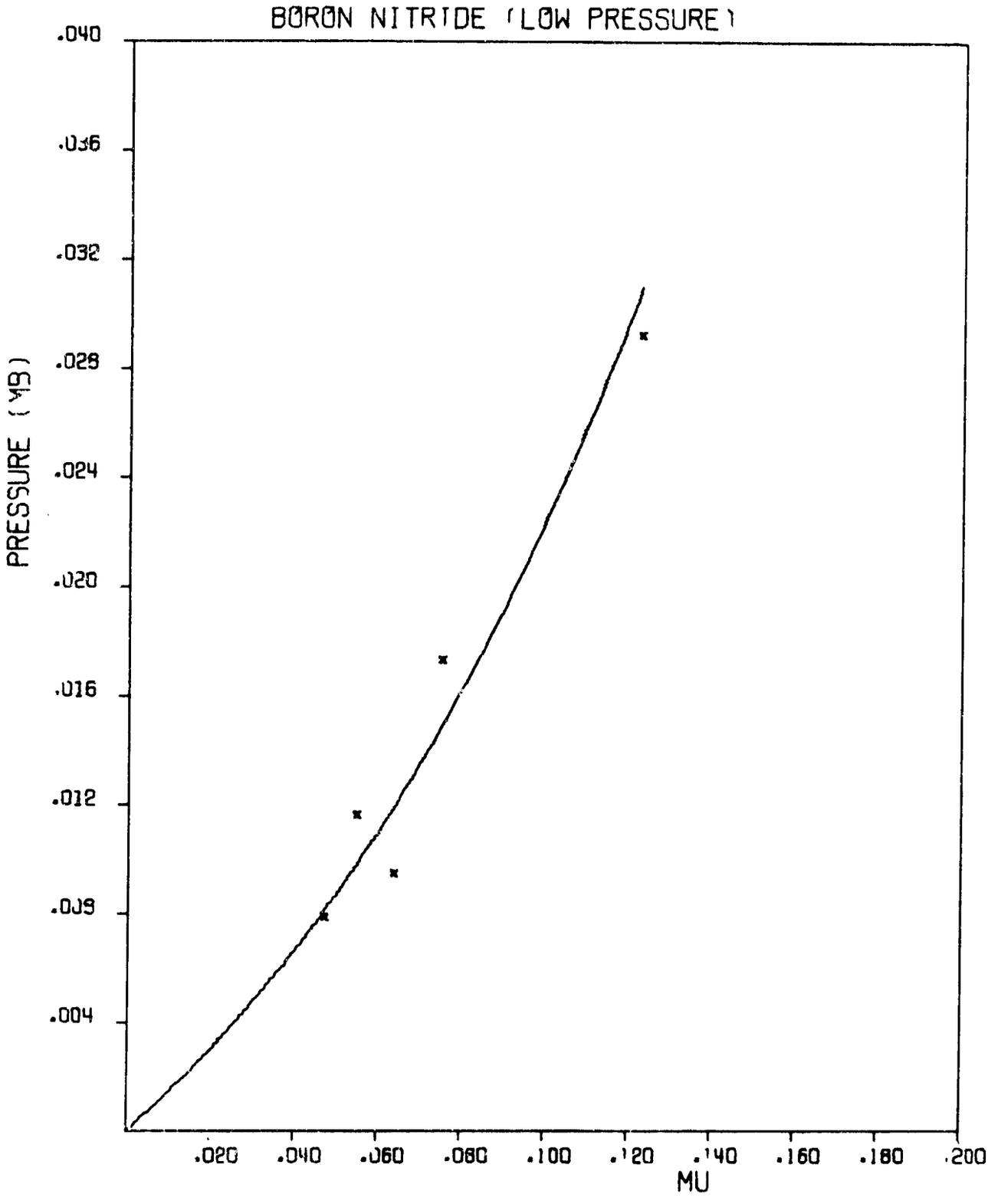
SLOPE OF US-UP= 2.7323

IN THE FIRST PLASTIC WAVE C1= .13928 * D1= .57219 S1= 2.83313

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
7.8600E-03	8.1681E-03	8.1681E-03	1.0473E+00	9.5484E-01	1.2873E-02	ETA	47
9.4900E-03	1.1951E-02	1.1951E-02	1.0638E+00	9.4003E-01	1.6301E-02	ETA	47
1.1650E-02	9.8400E-03	9.8400E-03	1.0549E+00	9.4796E-01	1.6824E-02	ETA	47
1.7340E-02	1.4942E-02	1.4942E-02	1.0753E+00	9.2997E-01	2.3809E-02	ETA	47
2.9240E-02	3.0979E-02	3.0979E-02	1.1228E+00	8.9063E-01	3.8639E-02	ETA	47

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.74320E-03(MB)


BORON NITRIDE (LOW PRESSURE)
PRESSURE (PSI)
.040
.036
.032
.028
.024
.020
.016
.012
.008
.004
.020
.040
.060
.080
.100
.120
.140
.160
.180
.200
MU

CUBIC FIT TO EQUATION OF STATE FOR BRASS

RHO(0)= 8.45000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF= 2.1449

AMU= 3.76202E-01(MB)

YO = 1.72000E-03(MB)

YMU= 2.28600E-03

HUGONIOT ELASTIC LIMIT = 3.91256E-03(MB)

CL= 4.700E-01(CM/MICROSEC)

CS= 2.110E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 5.700E-05

SPECIFIC HEAT(CP)= 3.770E+06

CB= 3.784E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.4294

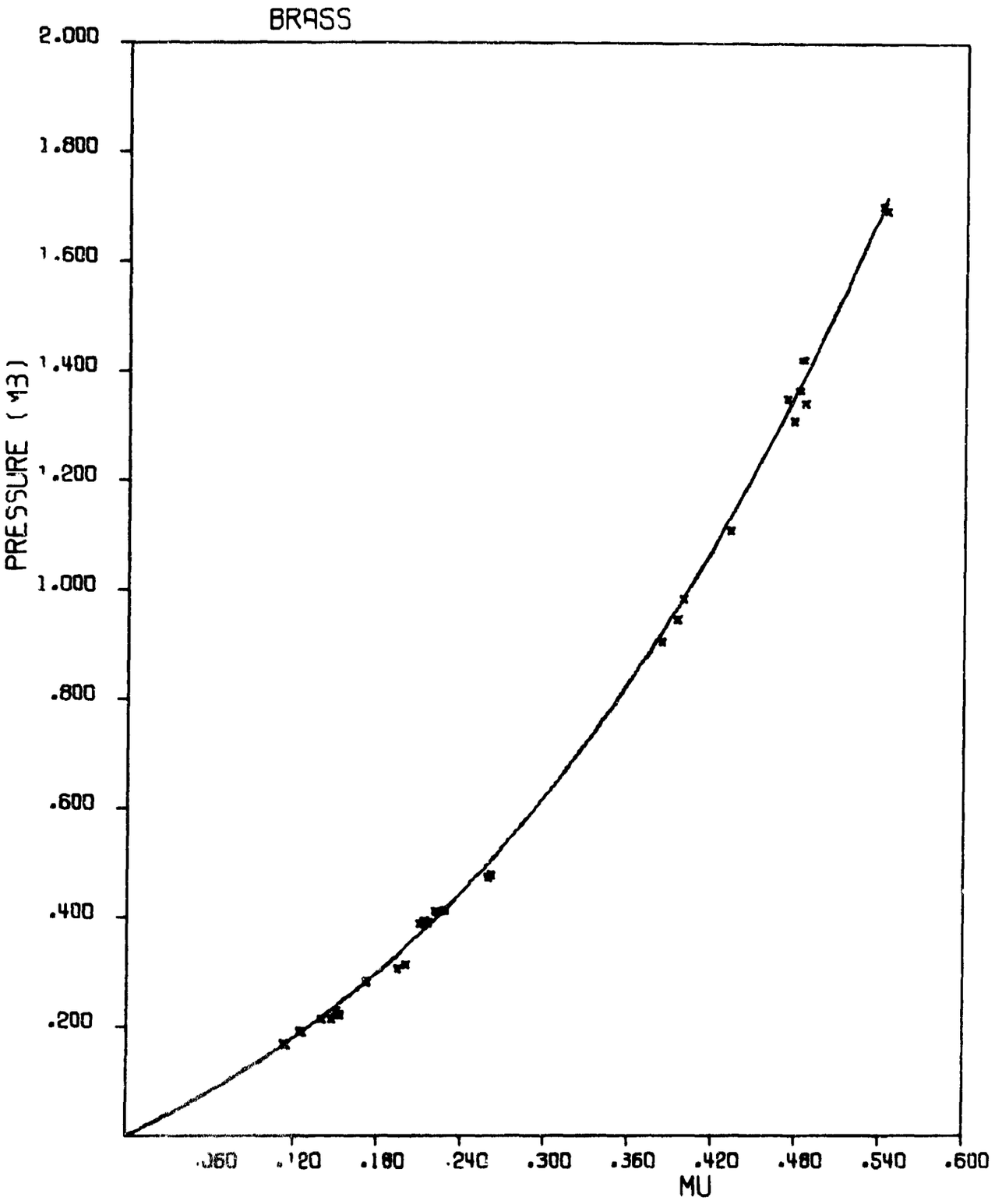
IN THE ELASTIC WAVE C0= 1.71153

IN THE FIRST PLASTIC WAVE C1= 1.20993 * D1= 2.03250 S1= 2.86633

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.6700E-01	1.7122E-01	1.7007E-01	1.1148E+00	8.9700E-01	4.5118E-02	V/VO	5
1.6800E-01	1.6900E-01	1.6785E-01	1.1136E+00	8.9800E-01	4.5033E-02	V/VO	5
1.9100E-01	1.8948E-01	1.8834E-01	1.1249E+00	8.8900E-01	5.0090E-02	V/VO	5
1.9200E-01	1.9143E-01	1.9069E-01	1.1261E+00	8.8800E-01	5.0447E-02	V/VO	5
2.1330E-01	2.3319E-01	2.3204E-01	1.1476E+00	8.7140E-01	5.6975E-02	V/VO	19
2.1400E-01	2.1873E-01	2.1758E-01	1.1403E+00	8.7700E-01	5.5812E-02	V/VO	5
2.2070E-01	2.4412E-01	2.4297E-01	1.1530E+00	8.6730E-01	5.8872E-02	V/VO	19
2.2900E-01	2.3955E-01	2.3840E-01	1.1507E+00	8.6900E-01	5.9583E-02	V/VO	5
2.8200E-01	2.8469E-01	2.8354E-01	1.1723E+00	8.5300E-01	7.0041E-02	V/VO	5
2.8400E-01	2.8469E-01	2.8354E-01	1.1723E+00	8.5300E-01	7.0289E-02	V/VO	5
3.0620E-01	3.3469E-01	3.3354E-01	1.1946E+00	8.3710E-01	7.6831E-02	V/VO	19
3.1480E-01	3.4918E-01	3.4804E-01	1.2008E+00	8.3280E-01	7.8924E-02	V/VO	19
3.8900E-01	3.7301E-01	3.7186E-01	1.2107E+00	8.2600E-01	8.9500E-02	V/VO	5
3.9100E-01	3.8756E-01	3.8642E-01	1.2165E+00	8.2200E-01	9.0755E-02	V/VO	5
3.9400E-01	3.8023E-01	3.7909E-01	1.2136E+00	8.2400E-01	9.0589E-02	V/VO	5
4.1100E-01	4.0253E-01	4.0139E-01	1.2225E+00	8.1800E-01	9.4087E-02	V/VO	5
4.1200E-01	3.9875E-01	3.9760E-01	1.2210E+00	8.1900E-01	9.3942E-02	V/VO	5
4.1500E-01	4.1794E-01	4.1679E-01	1.2285E+00	8.1400E-01	9.5577E-02	V/VO	5
4.7300E-01	5.0328E-01	5.0213E-01	1.2599E+00	7.9370E-01	1.0746E-01	V/VO	19
4.7800E-01	5.0736E-01	5.0622E-01	1.2614E+00	7.9280E-01	1.0826E-01	V/VO	19
9.0600E-01	9.2424E-01	9.2309E-01	1.3831E+00	7.2300E-01	1.7234E-01	V/VO	5
9.4700E-01	9.7159E-01	9.7045E-01	1.3947E+00	7.1700E-01	1.7809E-01	V/VO	5
9.8500E-01	9.8788E-01	9.8674E-01	1.3986E+00	7.1500E-01	1.8227E-01	V/VO	5
1.1080E+00	1.1373E+00	1.1361E+00	1.4327E+00	6.9800E-01	1.9900E-01	V/VO	5
1.3080E+00	1.3524E+00	1.3512E+00	1.4771E+00	6.7700E-01	2.2360E-01	V/VO	5
1.3420E+00	1.3977E+00	1.3965E+00	1.4859E+00	6.7300E-01	2.2789E-01	V/VO	5
1.3480E+00	1.3303E+00	1.3291E+00	1.4720E+00	6.7900E-01	2.2629E-01	V/VO	5
1.3650E+00	1.3748E+00	1.3737E+00	1.4815E+00	6.7500E-01	2.2913E-01	V/VO	5
1.4200E+00	1.3862E+00	1.3851E+00	1.4837E+00	6.7400E-01	2.3406E-01	V/VO	5
1.6940E+00	1.7176E+00	1.7164E+00	1.5432E+00	6.4800E-01	2.6564E-01	V/VO	5
1.7020E+00	1.7035E+00	1.7023E+00	1.5408E+00	6.4900E-01	2.6589E-01	V/VO	5

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.64720E-02(MB)


BRASS
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (13)
.060
.120
.180
.240
.300
.360
.420
.480
.540
.600
MU

CUBIC FIT TO EQUATION OF STATE FOR CADMIUM

RHO(0)= 8.64000

SUBLIMATION ENERGY= 9.41000E+09

GRUNEISEN COEF= 2.3300

AMU= 1.94400E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 2.780E-01(CM/MICROSEC)

CS= 1.500E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 9.180E-05

SPECIFIC HEAT(CP)= 2.600E+05

CB= 2.465E-01(CM/MICROSEC)

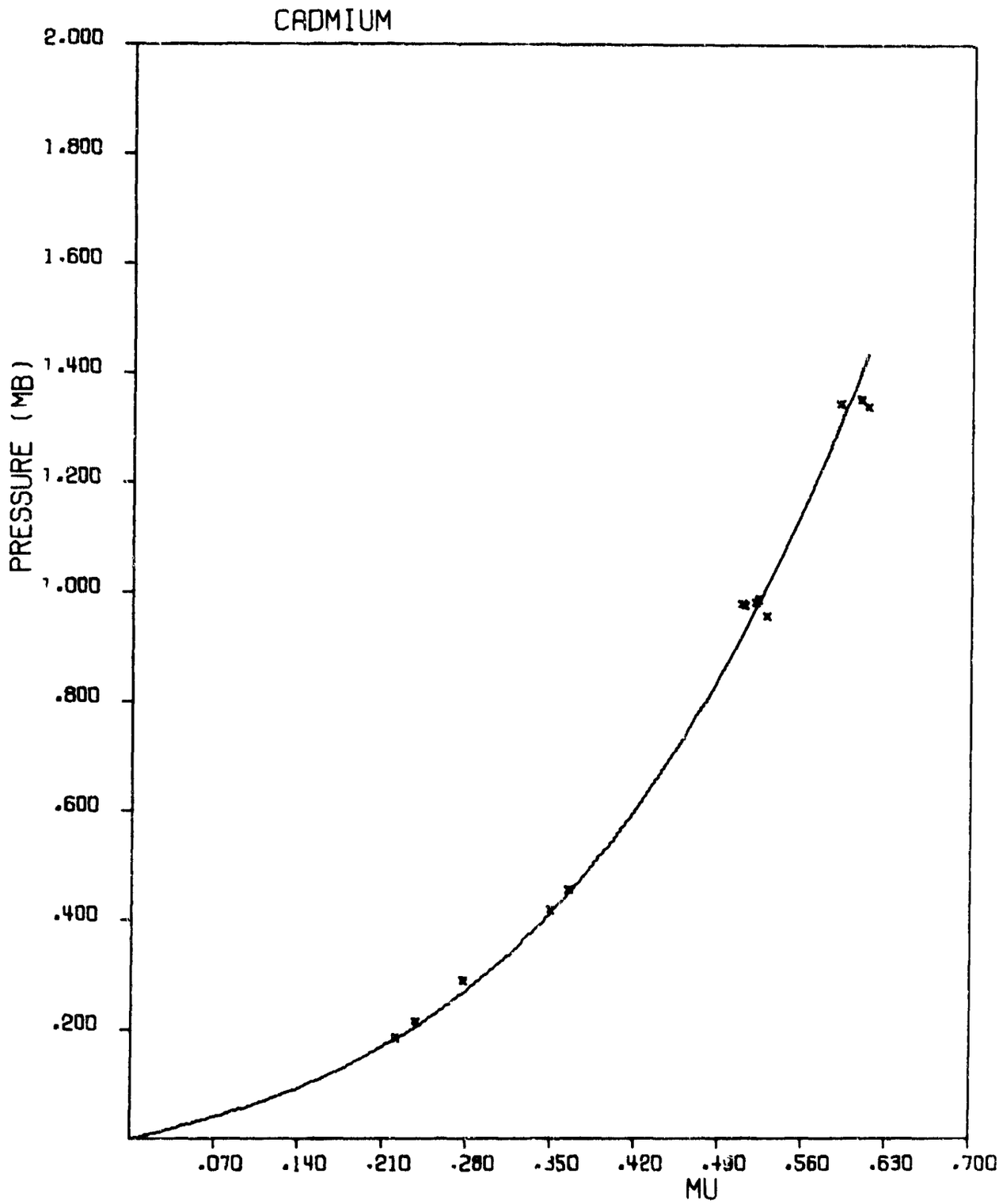
SLOPE OF US-UP= 1.6574

IN THE FIRST PLASTIC WAVE C1= .52499 * D1= .46414 S1= 4.07707

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.8290E-01	1.8250E-01	1.8250E-01	1.2209E+00	8.1910E-01	6.1883E-02	V/VO	19
2.1450E-01	2.0500E-01	2.0500E-01	1.2372E+00	8.0830E-01	6.8987E-02	V/VO	19
2.8760E-01	2.6793E-01	2.6793E-01	1.2771E+00	7.8300E-01	8.4990E-02	V/VO	19
4.1820E-01	4.1430E-01	4.1430E-01	1.3495E+00	7.4100E-01	1.1197E-01	V/VO	19
4.5730E-01	4.5171E-01	4.5171E-01	1.3650E+00	7.3260E-01	1.1897E-01	V/VO	19
9.5700E-01	1.0114E+00	1.0114E+00	1.5291E+00	6.5400E-01	1.9577E-01	V/VO	19
9.7600E-01	9.3170E-01	9.3170E-01	1.5106E+00	6.6200E-01	1.9540E-01	V/VO	19
9.8000E-01	9.2219E-01	9.2219E-01	1.5083E+00	6.6300E-01	1.9551E-01	V/VO	19
9.8200E-01	9.7072E-01	9.7072E-01	1.5198E+00	6.5800E-01	1.9716E-01	V/VO	19
9.8600E-01	9.8073E-01	9.8073E-01	1.5221E+00	6.5700E-01	1.9785E-01	V/VO	19
1.3390E+00	1.4348E+00	1.4348E+00	1.6129E+00	6.2000E-01	2.4268E-01	V/VO	19
1.3450E+00	1.3077E+00	1.3077E+00	1.5898E+00	6.2900E-01	2.4032E-01	V/VO	19
1.3510E+00	1.4055E+00	1.4055E+00	1.6077E+00	6.2200E-01	2.4312E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 3.07486E-02(MB)


CADMIUM
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.070
.140
.210
.280
.350
.420
.490
.560
.630
.700
MU

CUBIC FIT TO EQUATION OF STATE FOR BORON CARBIDE

RHO(0)= 1.92000

SUBLIMATION ENERGY= 1.47000E+11

GRUNEISEN COEF=-0. *NO DATA

ANU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 2.100E-05

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 2.951E-01(CM/MICROSEC)

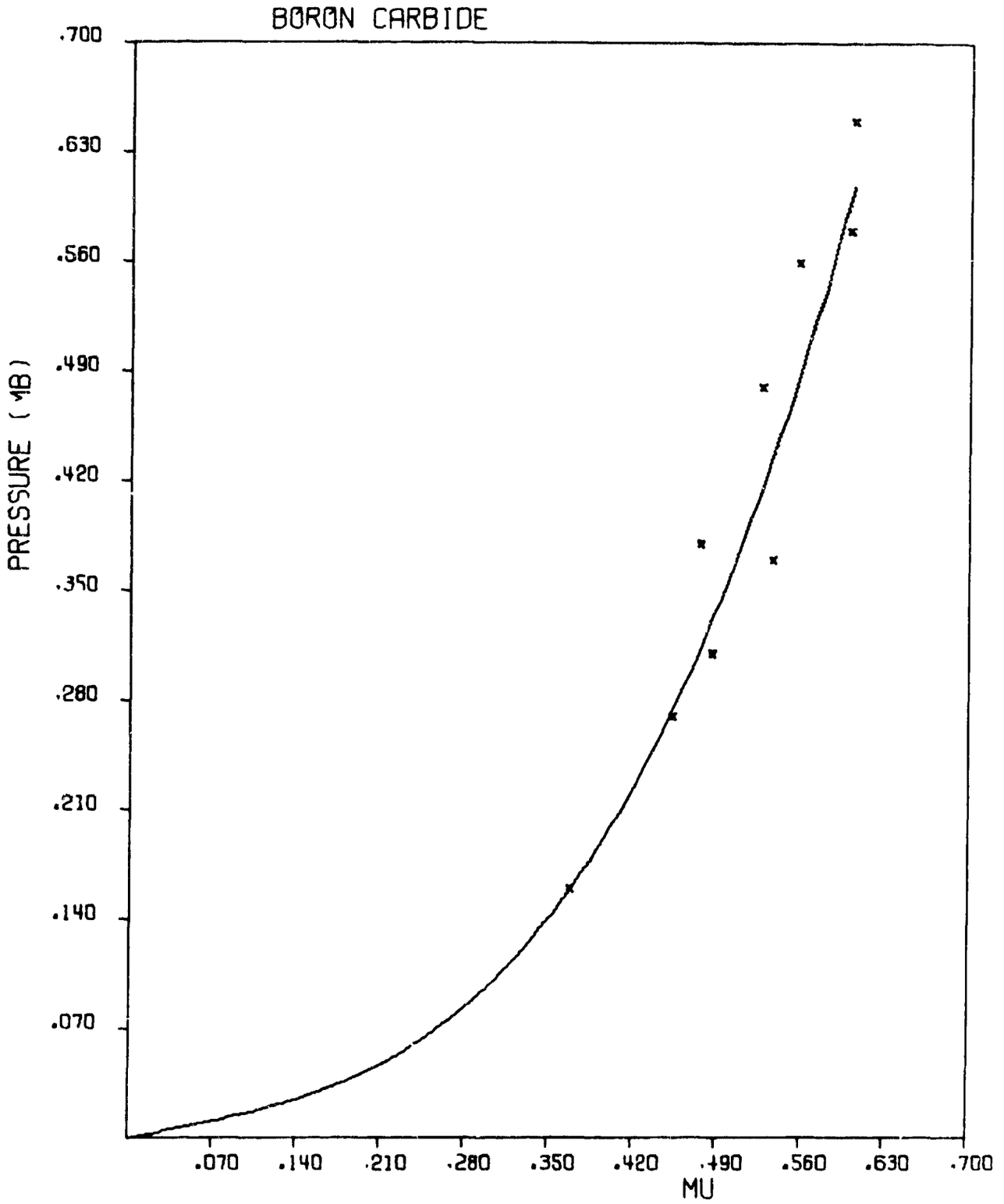
SLOPE OF US-UP= 1.8100

IN THE FIRST PLASTIC WAVE C1= .16720 * D1= -.33439 S1= 2.87552

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.6000E-01	1.5954E-01	1.5954E-01	1.3680E+00	7.3100E-01	1.4972E-01	V/VO	20
2.7000E-01	2.7523E-01	2.7523E-01	1.4535E+00	6.8800E-01	2.0946E-01	V/VO	20
3.1000E-01	3.3215E-01	3.3215E-01	1.4859E+00	6.7300E-01	2.2978E-01	V/VO	20
3.8000E-01	3.1202E-01	3.1202E-01	1.4749E+00	6.7800E-01	2.5245E-01	V/VO	20
3.7000E-01	4.3658E-01	4.3658E-01	1.5361E+00	6.5100E-01	2.5934E-01	V/VO	20
5.6000E-01	4.8787E-01	4.8787E-01	1.5576E+00	6.4200E-01	3.2314E-01	V/VO	20
4.8000E-01	4.1549E-01	4.1549E-01	1.5267E+00	6.5500E-01	2.9368E-01	V/VO	20
5.8000E-01	6.0105E-01	6.0105E-01	1.6000E+00	6.2500E-01	3.3657E-01	V/VO	20
6.5000E-01	6.0845E-01	6.0845E-01	1.6026E+00	6.2400E-01	3.5678E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 4.01828E-02(MB)


BORON CARBIDE
.700
.630
.560
.490
.420
.350
.280
.210
.140
.070
PRESSURE (MB)
.070
.140
.210
.280
.350
.420
.490
.560
.630
.700
MU

CUBIC FIT TO EQUATION OF STATE FOR SILICON CARBIDE RHO=2.32

RHO(0)= 2.32000

SUBLIMATION ENERGY= 1.41000E+11

GRUNEISEN COEF=-0. *NO DATA

AMU= 1.28075E+00(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 1.173E+00(CM/MICROSEC)

CS= 7.430E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 1.500E-05

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 2.850E-01(CM/MICROSEC)

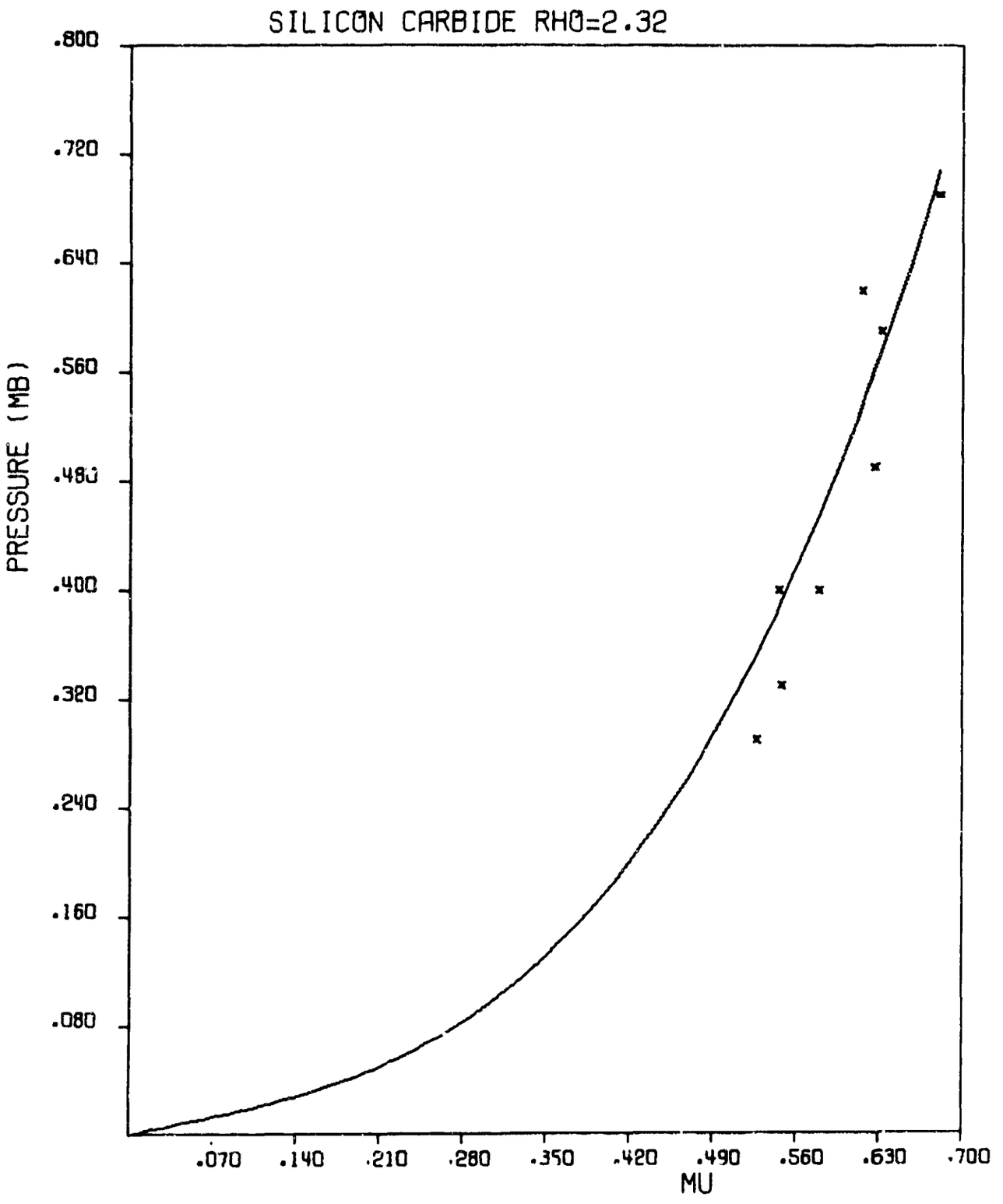
SLOPE OF US-UP= 1.6616

IN THE FIRST PLASTIC WAVE C1= .18844 * D1= -.22771 S1= 2.17304

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
3.3000E-01	3.9247E-01	3.9247E-01	1.5480E+00	6.4600E-01	2.2440E-01	V/VO	20
2.9000E-01	3.5362E-01	3.5362E-01	1.5267E+00	6.5500E-01	2.0767E-01	V/VO	20
4.0000E-01	3.8795E-01	3.8795E-01	1.5456E+00	6.4700E-01	2.4670E-01	V/VO	20
4.0000E-01	4.5821E-01	4.5821E-01	1.5798E+00	6.3300E-01	2.5155E-01	V/VO	20
4.9000E-01	5.6185E-01	5.6185E-01	1.6260E+00	6.1500E-01	2.8516E-01	V/VO	20
5.9000E-01	5.7500E-01	5.7500E-01	1.6313E+00	6.1300E-01	3.1372E-01	V/VO	20
6.2000E-01	5.3644E-01	5.3644E-01	1.6155E+00	6.1900E-01	3.1909E-01	V/VO	20
6.9000E-01	7.0807E-01	7.0807E-01	1.6807E+00	5.9500E-01	3.4706E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 4.78537E-02(MB)


SILICON CARBIDE RHO=2.32
.800
.720
.640
.560
.480
.400
.320
.240
.160
.080
PRESSURE (MB)
.070
.140
.210
.280
.350
.420
.490
.560
.630
.700
MU

CUBIC FIT TO EQUATION OF STATE FOR TUNGSTEN CARBIDE

RHO(0)= 15.02000

SUBLIMATION ENERGY= 7.82800E+10

GRUNEISEN COEF=-0. *NO DATA

AMU= 2.62435E+00(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 6.890E-01(CM/MICROSEC)

CS= 4.180E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 1.440E-05

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 5.181E-01(CM/MICROSEC)

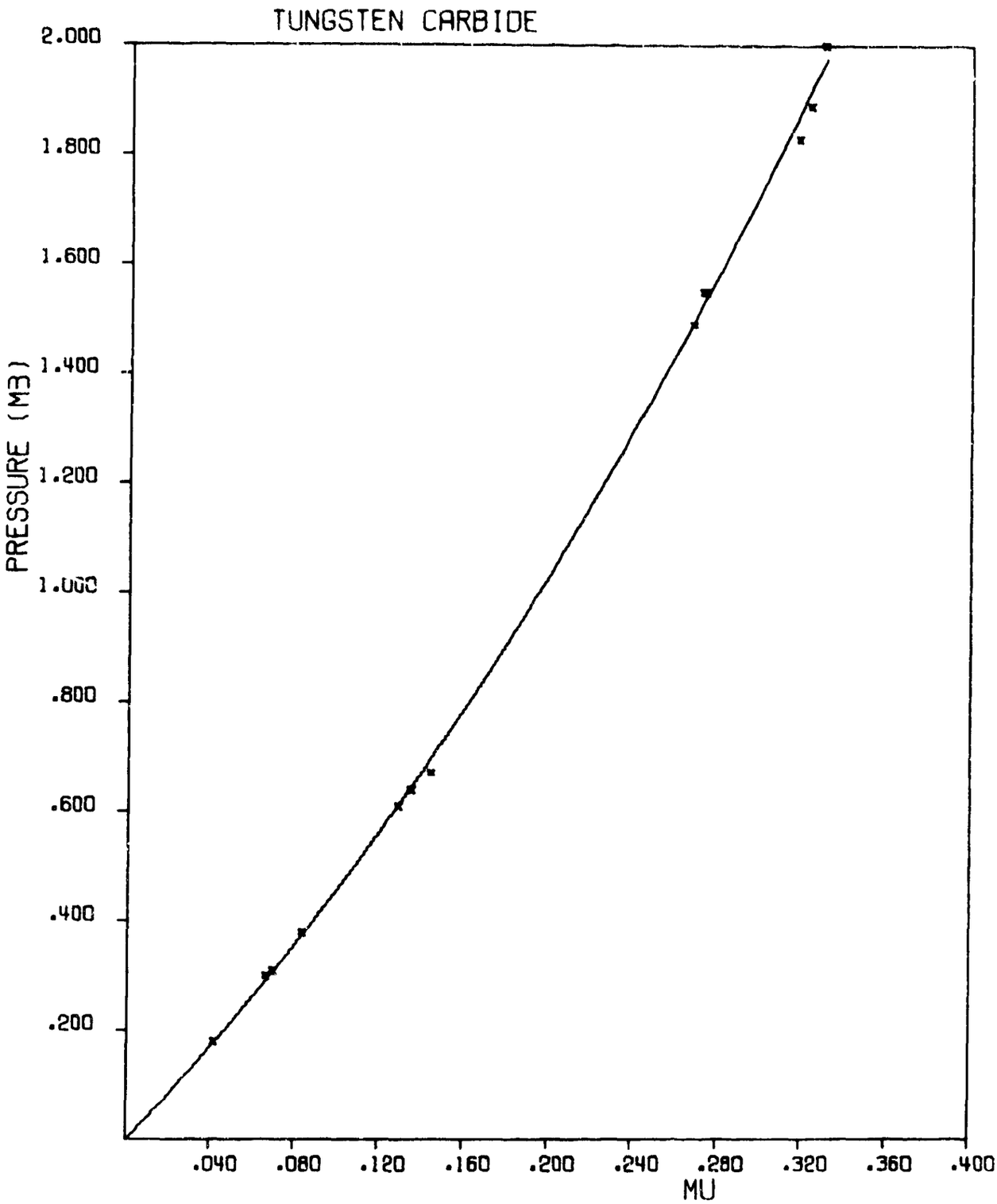
SLOPE OF US-UP= 1.1640

IN THE FIRST PLASTIC WAVE C1= 4.03178 * D1= 5.33142 S1= 1.85336

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.8000E-01	1.7738E-01	1.7738E-01	1.0417E+00	9.6000E-01	2.1894E-02	V/VO	19
3.0000E-01	2.9032E-01	2.9032E-01	1.0661E+00	9.3800E-01	3.5190E-02	V/VO	19
3.1000E-01	3.0667E-01	3.0667E-01	1.0695E+00	9.3500E-01	3.6627E-02	V/VO	19
3.8000E-01	3.7453E-01	3.7453E-01	1.0834E+00	9.2300E-01	4.4137E-02	V/VO	19
6.1000E-01	6.1097E-01	6.1097E-01	1.1287E+00	8.8600E-01	6.8043E-02	V/VO	19
6.4000E-01	6.4643E-01	6.4643E-01	1.1351E+00	8.8100E-01	7.1208E-02	V/VO	19
6.7000E-01	6.9760E-01	6.9760E-01	1.1442E+00	8.7400E-01	7.4970E-02	V/VO	19
1.4900E+00	1.4949E+00	1.4949E+00	1.2674E+00	7.8900E-01	1.4468E-01	V/VO	19
1.5500E+00	1.5303E+00	1.5303E+00	1.2723E+00	7.8600E-01	1.4861E-01	V/VO	19
1.5500E+00	1.5423E+00	1.5423E+00	1.2739E+00	7.8500E-01	1.4895E-01	V/VO	19
1.8300E+00	1.8770E+00	1.8770E+00	1.3175E+00	7.5900E-01	1.7136E-01	V/VO	19
1.8900E+00	1.9189E+00	1.9189E+00	1.3228E+00	7.5600E-01	1.7522E-01	V/VO	19
2.0000E+00	1.9759E+00	1.9759E+00	1.3298E+00	7.5200E-01	1.8172E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.44994E-02(MB)


TUNGSTEN CARBIDE
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (M3)
.040
.080
.120
.160
.200
.240
.280
.320
.360
.400
MU

CUBIC FIT TO EQUATION OF STATE FOR CARBON PHENOLIC

RHO(0)= 1.49000

SUBLIMATION ENERGY= 1.04000E+11

GRUNEISEN COEF= 1.0961

AMU= 1.00724E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 3.817E-01(CM/MICROSEC)

CS= 2.600E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 4.890E-05

SPECIFIC HEAT(CP)= 7.870E+06

CB= 4.200E-01(CM/MICROSEC)

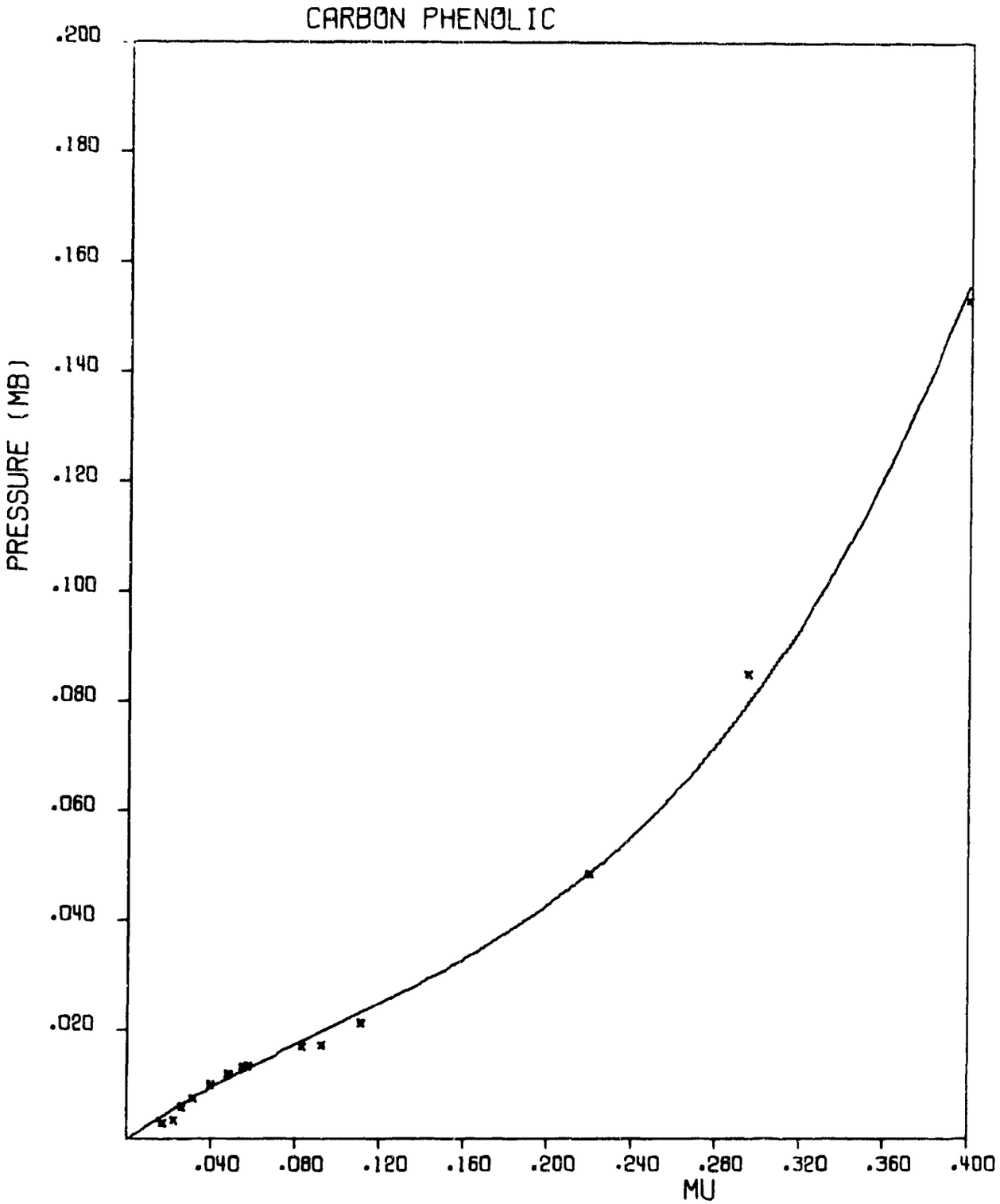
SLOPE OF US-UP= -0.

IN THE FIRST PLASTIC WAVE C1= .26284 * D1= -.80899 S1= 2.82512

P(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.10500E-02	2.30710 -02	1.11100E+00	9.00090E-01	3.75697E-02	ETA	1
1.70000E-02	1.78576E-02	1.08300E+00	9.23361E-01	2.95703E-02	ETA	1
1.71400E-02	1.96449E-02	1.09260E+00	9.15248E-01	3.12239E-02	ETA	1
1.31100E-02	1.24788E-02	1.05500E+00	9.47867E-01	2.14172E-02	ETA	1
1.33500E-02	1.30743E-02	1.05800E+00	9.45180E-01	2.21625E-02	ETA	1
1.18600E-02	1.10851E-02	1.04810E+00	9.54107E-01	1.91126E-02	ETA	1
9.84000E-03	9.31512E-03	1.03960E+00	9.61908E-01	1.58606E-02	ETA	1
7.47000E-03	7.60895E-03	1.03170E+00	9.69274E-01	1.24114E-02	ETA	1
5.86000E-03	6.44962E-03	1.02650E+00	9.74184E-01	1.00763E-02	ETA	1
3.46000E-03	5.51336E-03	1.02240E+00	9.78091E-01	7.13277E-03	ETA	1
2.94000E-03	4.29582E-03	1.01720E+00	9.83091E-01	5.77619E-03	ETA	1
4.85000E-02	4.87508E-02	1.22000E+00	8.19672E-01	7.66142E-02	ETA	23
8.50000E-02	7.96620E-02	1.29500E+00	7.72201E-01	1.13997E-01	ETA	23
1.53000E-01	1.55531E-01	1.39900E+00	7.14796E-01	1.71132E-01	ETA	23

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.41798E-03(MB)


CARBON PHENOLIC
PRESSURE (MB)
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
.040
.080
.120
.160
.200
.240
.280
.320
.360
.400
MU

CUBIC FIT TO EQUATION OF STATE FOR =D CARBON PHENOLIC

RHO(0)= 1.3400

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF=-0. *NO DATA

AMU= 0. (MB) *NO DATA

Y0 =-0. (MB)

YM0= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 3.000E-01(CM/MICROSEC)

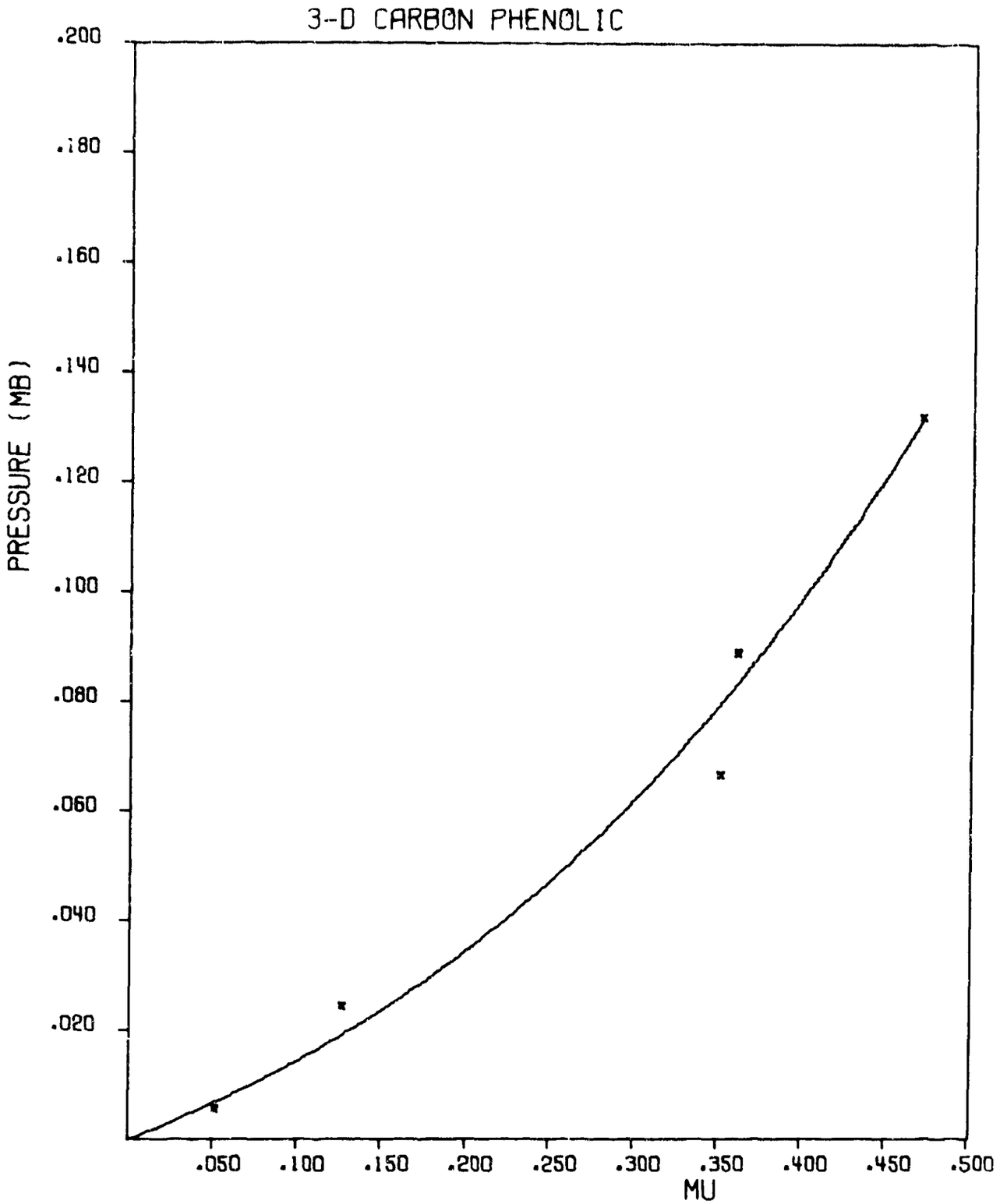
SLOPE OF US-UP= 1.4287

IN THE FIRST PLASTIC WAVE C1= .12060 * D1= .19967 S1= .28696

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
5.6000E-03	6.8515E-03	6.8515E-03	1.0520E+00	9.5057E-01	1.4373E-02	ETA	23
2.4500E-02	1.9124E-02	1.9124E-02	1.1270E+00	8.8731E-01	4.5391E-02	ETA	23
6.6700E-02	7.9707E-02	7.9707E-02	1.3520E+00	7.3964E-01	1.1384E-01	ETA	23
8.9800E-02	8.3435E-02	8.3435E-02	1.3620E+00	7.3421E-01	1.3271E-01	ETA	23
1.3200E-01	1.3158E-01	1.3158E-01	1.4720E+00	6.7935E-01	1.7773E-01	ETA	23

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 5.08335E-03(MB)


3-D CARBON PHENOLIC
PRESSURE (MB)
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR CHROMIUM

RHO(0)= 7.12000

SUBLIMATION ENERGY= 7.52700E+10

GRUNEISEN COEF= 2.0700

AMU= 1.32876E+00(MB)

YO = 3.45000E-03(MB)

YMU= 1.29820E-03

HUGONIOT ELASTIC LIMIT = 4.89151E-03(MB)

CL= 6.600E-01(CM/MICROSEC)

CS= 4.320E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 2.520E-05

SPECIFIC HEAT(CP)= 2.330E+06

CB= 5.295E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.3783

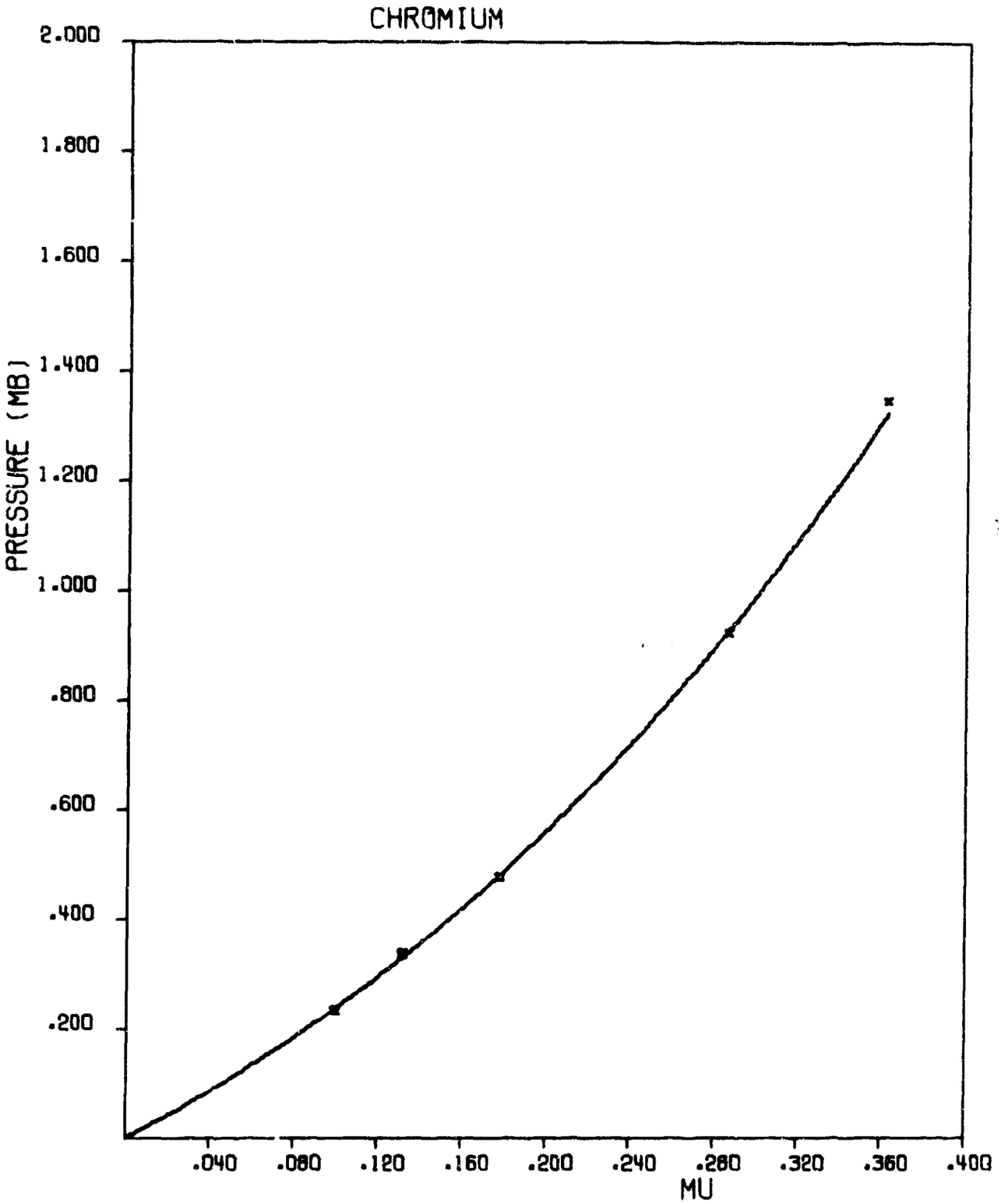
IN THE ELASTIC WAVE C0= 3.76792

IN THE FIRST PLASTIC WAVE C1= 1.99624 * D1= 3.41173 S1= 3.18171

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.345 0E-01	2.3685E-01	2.3455E-01	1.0991E+00	9.0980E-01	5.4505E-02	V/VO	19
2.3300E-01	2.3986E-01	2.3756E-01	1.1002E+00	9.0890E-01	5.4601E-02	V/VO	19
3.3800E-01	3.3214E-01	3.2984E-01	1.1319E+00	8.8350E-01	7.4367E-02	V/VO	19
3.3800E-01	3.3372E-01	3.3142E-01	1.1324E+00	8.8310E-01	7.4495E-02	V/VO	19
3.3600E-01	3.3254E-01	3.3024E-01	1.1320E+00	8.8340E-01	7.4179E-02	V/VO	19
3.3600E-01	3.3214E-01	3.2984E-01	1.1319E+00	8.8350E-01	7.4147E-02	V/VO	19
4.7800E-01	4.8414E-01	4.8184E-01	1.1781E+00	8.4880E-01	1.0075E-01	V/VO	19
4.7900E-01	4.8317E-01	4.8087E-01	1.1779E+00	8.4900E-01	1.0079E-01	V/VO	19
9.2400E-01	9.3146E-01	9.2916E-01	1.2870E+00	7.7700E-01	1.7012E-01	V/VO	19
1.3470E+00	1.3252E+00	1.3229E+00	1.3624E+00	7.3400E-01	2.2433E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 6.62085E-03(MB)


CHROMIUM
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.040
.080
.120
.160
.200
.240
.280
.320
.360
.400
MU

CUBIC FIT TO EQUATION OF STATE FOR COBALT

RHO(0)= 8.82000

SUBLIMATION ENERGY= 7.10800E+10

GRUNEISEN COEF= 2.0516

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 3.690E-05

SPECIFIC HEAT(CP)= 4.144E+06

CB= 4.800E-01(CM/MICROSEC)

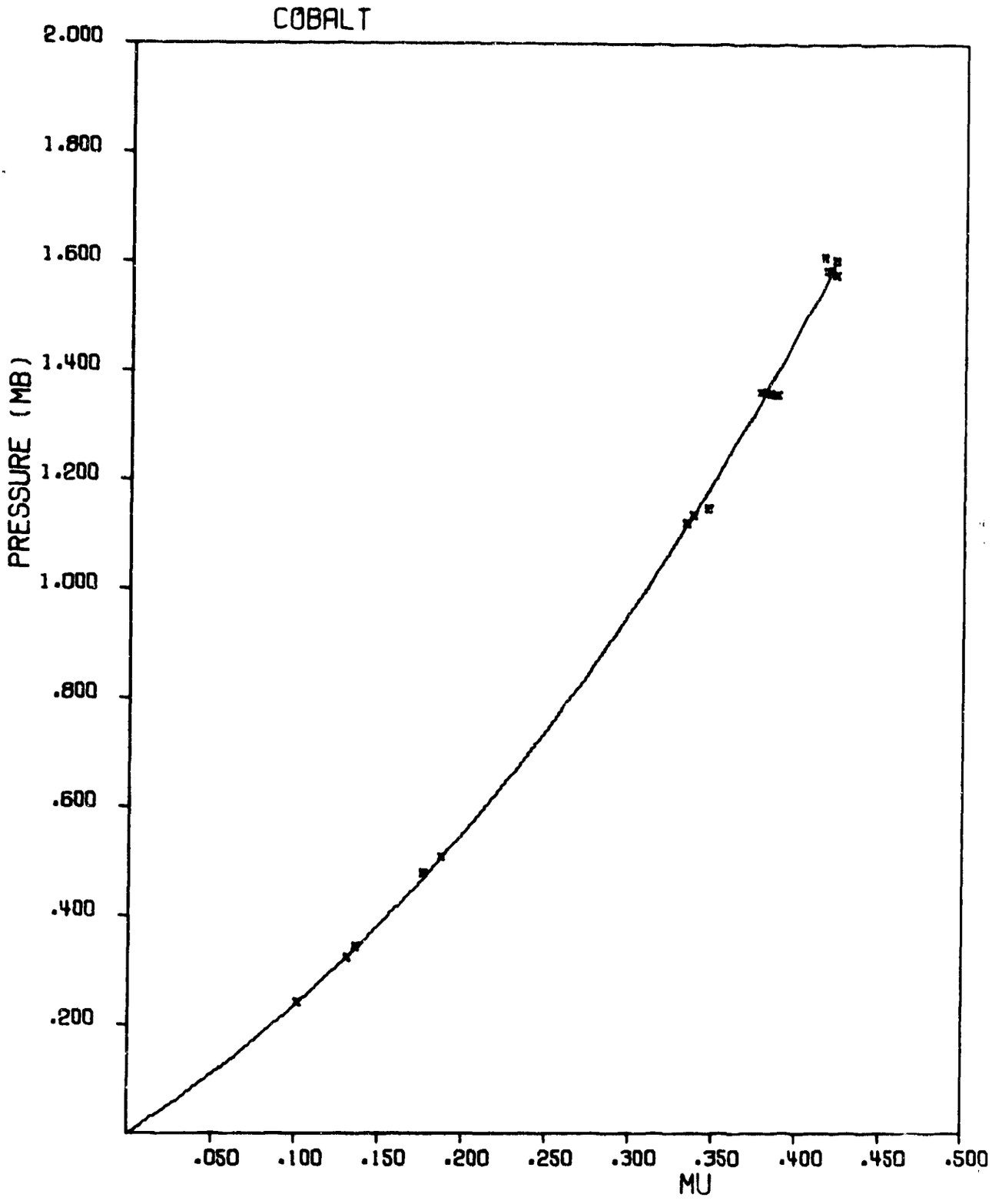
SLOPE OF US-UP= 1.3038

IN THE FIRST PLASTIC WAVE C1= 2.03213 * D1= 3.16663 S1= 2.42554

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.4110E-01	2.4160E-01	2.4160E-01	1.1016E+00	9.0780E-01	5.0203E-02	V/VO	13
3.4320E-01	3.4175E-01	3.4175E-01	1.1362E+00	8.8010E-01	6.8304E-02	V/VO	13
3.2440E-01	3.2628E-01	3.2628E-01	1.1311E+00	8.8410E-01	6.5290E-02	V/VO	13
4.7810E-01	4.6915E-01	4.6915E-01	1.1761E+00	8.5030E-01	9.0082E-02	V/VO	13
5.0980E-01	5.0788E-01	5.0788E-01	1.1874E+00	8.4220E-01	9.5503E-02	V/VO	13
1.1210E+00	1.1191E+00	1.1191E+00	1.3333E+00	7.5000E-01	1.7825E-01	V/VO	5
1.1370E+00	1.1368E+00	1.1368E+00	1.3369E+00	7.4800E-01	1.8024E-01	V/VO	5
1.1480E+00	1.1821E+00	1.1821E+00	1.3459E+00	7.4300E-01	1.8290E-01	V/VO	5
1.3620E+00	1.3484E+00	1.3484E+00	1.3774E+00	7.2600E-01	2.0570E-01	V/VO	5
1.3580E+00	1.3798E+00	1.3798E+00	1.3831E+00	7.2300E-01	2.0652E-01	V/VO	5
1.3570E+00	1.4011E+00	1.4011E+00	1.3870E+00	7.2100E-01	2.0710E-01	V/VO	5
1.5840E+00	1.5705E+00	1.5705E+00	1.4164E+00	7.0600E-01	2.2978E-01	V/VO	5
1.5810E+00	1.5825E+00	1.5825E+00	1.4184E+00	7.0500E-01	2.2995E-01	V/VO	5
1.5770E+00	1.6066E+00	1.6066E+00	1.4225E+00	7.0300E-01	2.3044E-01	V/VO	5
1.6080E+00	1.5587E+00	1.5587E+00	1.4144E+00	7.0700E-01	2.3112E-01	V/VO	5
1.6030E+00	1.6066E+00	1.6066E+00	1.4225E+00	7.0300E-01	2.3233E-01	V/VO	5

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.42483E-02(MB)


COBALT
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR COPPER

RHO(0)= 8.93000

SUBLIMATION ENERGY= 5.24500E+10

GRUNEISEN COEF= 1.9600

AMU= 4.56109E-01(MB)

YO = 7.58000E-04(MB)

YMU= 8.30942E-04

HUGONIOT ELASTIC LIMIT = 1.64557E-03(MB)

CL= 4.700E-01(CM/MICROSEC)

CS= 2.260E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 5.040E-05

SPECIFIC HEAT(CP)= 3.860E+06

CB= 3.920E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.4880

IN THE ELASTIC WAVE C0= 1.98036

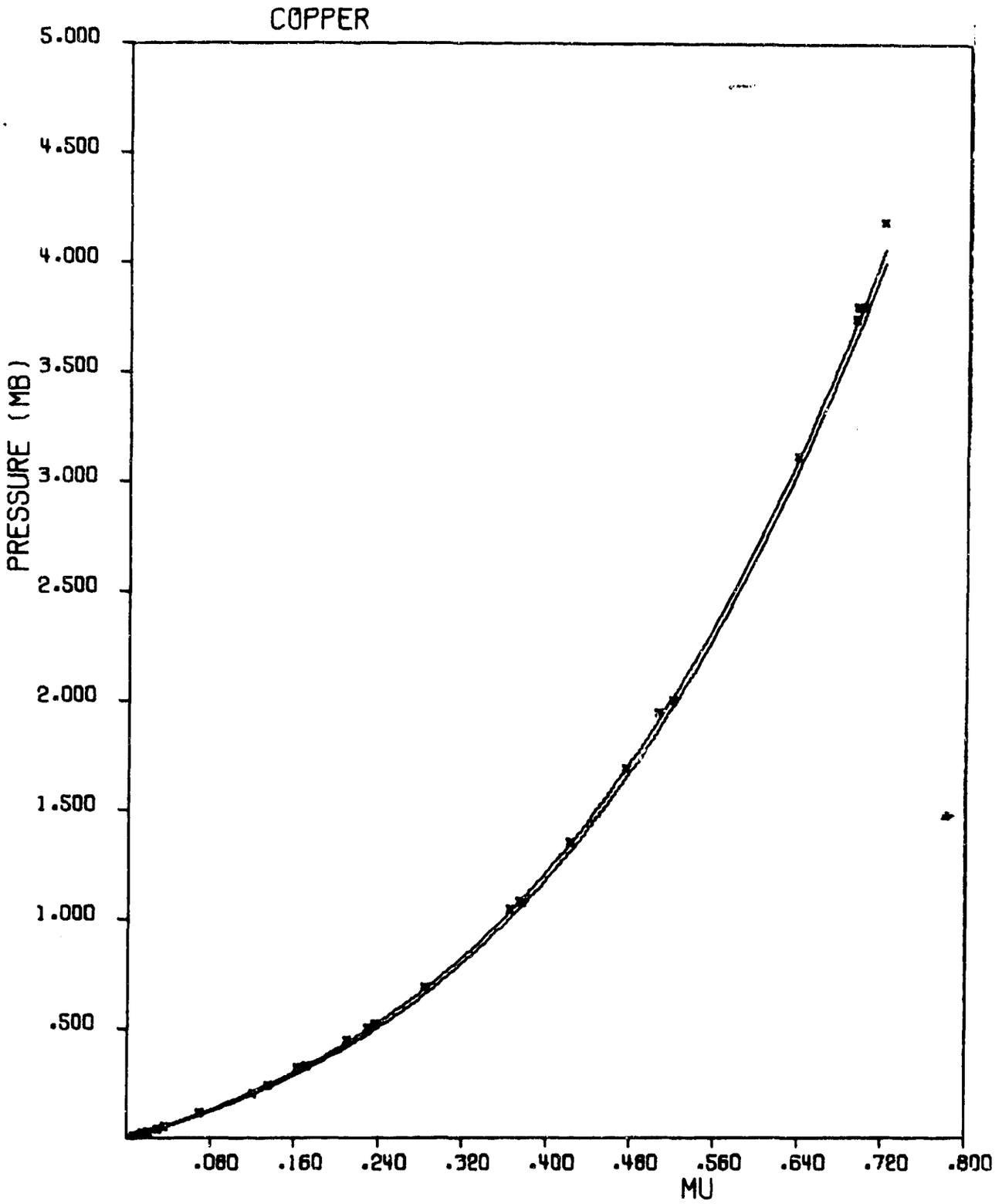
IN THE FIRST PLASTIC WAVE C1= 1.37222 * D1= 1.75178 S1= 5.64322

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
5.7000E-03	6.9013E-03	6.0992E-03	1.0044E+00	9.9560E-01	1.6759E-03	V/VO	24
1.0190E-02	1.1233E-02	1.0188E-02	1.0074E+00	9.9270E-01	2.8862E-03	V/VO	24
2.1820E-02	2.3175E-02	2.1470E-02	1.0153E+00	9.8490E-01	6.0742E-03	V/VO	24
2.9860E-02	3.1386E-02	2.9236E-02	1.0207E+00	9.7970E-01	8.2389E-03	V/VO	24
4.3350E-02	4.5436E-02	4.2538E-02	1.0298E+00	9.7110E-01	1.1845E-02	V/VO	24
5.2920E-02	5.6124E-02	5.2670E-02	1.0365E+00	9.6480E-01	1.4443E-02	V/VO	24
1.1595E-01	1.1399E-01	1.0770E-01	1.0707E+00	9.3400E-01	2.9274E-02	V/VO	24
2.0580E-01	2.1149E-01	2.0107E-01	1.1207E+00	8.9230E-01	4.9820E-02	V/VO	13
2.4190E-01	2.4456E-01	2.3289E-01	1.1358E+00	8.8040E-01	5.6919E-02	V/VO	13
3.2080E-01	3.0872E-01	2.9480E-01	1.1631E+00	8.5980E-01	7.0968E-02	V/VO	13
3.2620E-01	3.2787E-01	3.1332E-01	1.1707E+00	8.5420E-01	7.2979E-02	V/VO	13
4.5000E-01	4.3569E-01	4.1768E-01	1.2101E+00	8.2640E-01	9.3531E-02	V/VO	15
5.0590E-01	4.9835E-01	4.7884E-01	1.2306E+00	8.1260E-01	1.0304E-01	V/VO	13
5.2400E-01	5.1881E-01	4.9877E-01	1.2370E+00	8.0840E-01	1.0603E-01	V/VO	8
6.9200E-01	6.8430E-01	6.6037E-01	1.2840E+00	7.7880E-01	1.3092E-01	V/VO	8
1.0460E+00	1.0393E+00	1.0087E+00	1.3650E+00	7.3260E-01	1.7696E-01	V/VO	8
1.0790E+00	1.1005E+00	1.0688E+00	1.3770E+00	7.2620E-01	1.8189E-01	V/VO	8
1.0870E+00	1.0848E+00	1.0535E+00	1.3740E+00	7.2780E-01	1.8203E-01	V/VO	8
1.3520E+00	1.3509E+00	1.3156E+00	1.4221E+00	7.0320E-01	2.1198E-01	V/VO	8
1.6920E+00	1.6911E+00	1.6513E+00	1.4749E+00	6.7800E-01	2.4700E-01	V/VO	8
1.9500E+00	1.9164E+00	1.8741E+00	1.5060E+00	6.6400E-01	2.7087E-01	V/VO	8
2.0060E+00	2.0168E+00	1.9735E+00	1.5191E+00	6.5830E-01	2.7705E-01	V/VO	8
3.1170E+00	3.1044E+00	3.0512E+00	1.6377E+00	6.1060E-01	3.6867E-01	V/VO	8
3.7400E+00	3.7167E+00	3.6590E+00	1.6920E+00	5.9100E-01	4.1383E-01	V/VO	8
3.7960E+00	3.7408E+00	3.6830E+00	1.6941E+00	5.9030E-01	4.1732E-01	V/VO	8
3.8000E+00	3.8141E+00	3.7558E+00	1.7001E+00	5.8820E-01	4.1861E-01	V/VO	15
4.1870E+00	4.0823E+00	4.0023E+00	1.7200E+00	5.8140E-01	4.4302E-01	V/VO	8

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 3.42143E-02(MB)

YADD AT .2MU = 2.471E-02


COPPER
5.000
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
.500
PRESSURE (MB)
.080
.160
.240
.320
.400
.480
.560
.640
.720
.800
MU

CUBIC FIT TO EQUATION OF STATE FOR DURITE

RHO(0)= 1.38000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF=-0. *NO DATA

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 2.847E-01(CM/MICROSEC)

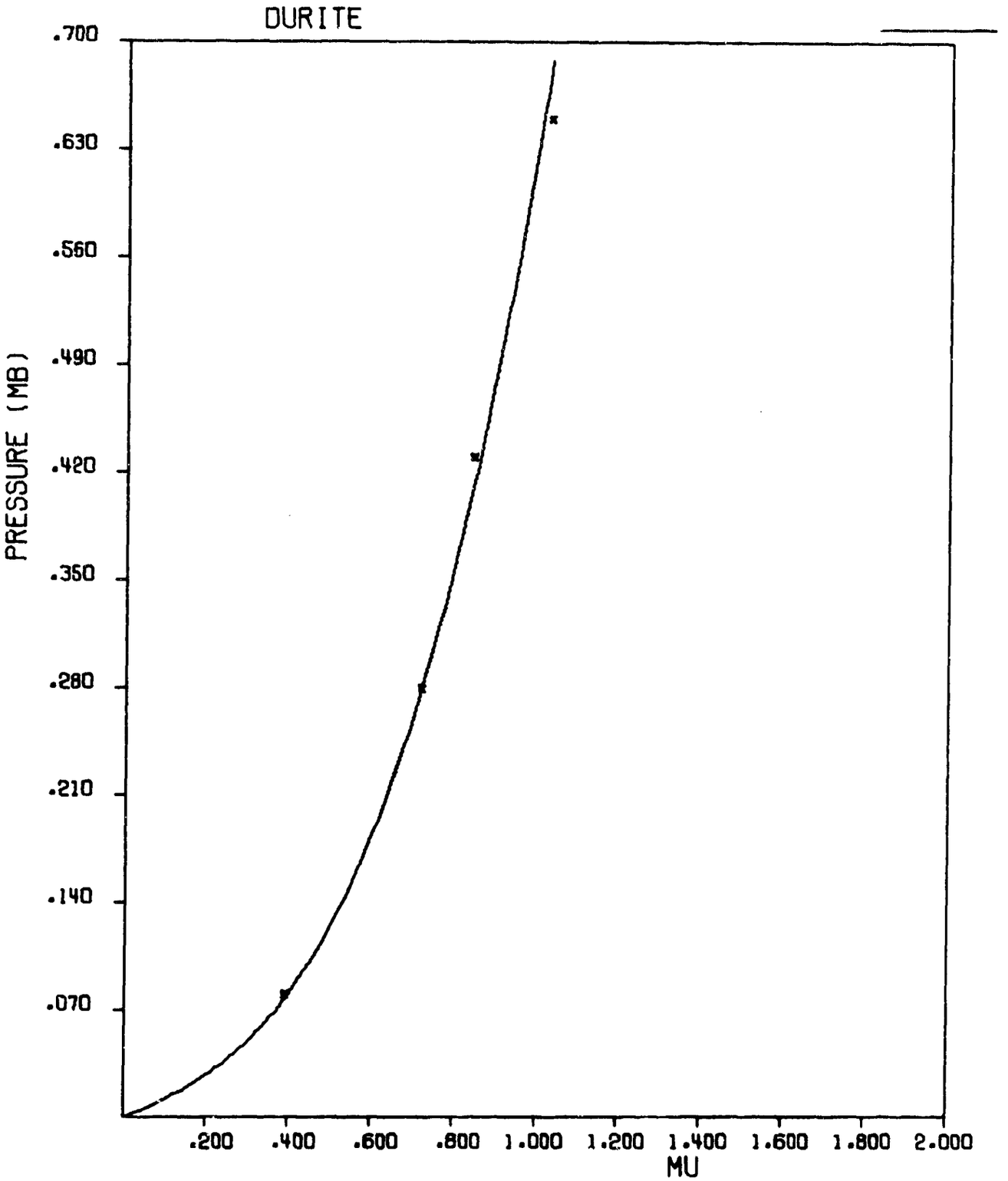
SLOPE OF US-UP= 1.4051

IN THE FIRST PLASTIC WAVE C1= .11185 * D1= .02951 S1= .49106

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
8.0000E-02	7.7536E-02	7.7536E-02	1.3908E+00	7.1900E-01	1.2763E-01	V/VO	20
2.8000E-01	2.8020E-01	2.8020E-01	1.7212E+00	5.8100E-01	2.9157E-01	V/VO	20
4.3000E-01	4.1189E-01	4.1189E-01	1.8450E+00	5.4200E-01	3.7777E-01	V/VO	20
6.5000E-01	6.8750E-01	6.8750E-01	2.0325E+00	4.9200E-01	4.8916E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.45665E-02(MB)


DURITE
.700
.630
.560
.490
.420
.350
.280
.210
.140
.070
PRESSURE (MB)
.200
.400
.600
.800
1.000
1.200
1.400
1.600
1.800
2.000
MU

CUBIC FIT TO EQUATION OF STATE FOR EPOXY

RHO(0)= 1.20000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COFF=-0. *NO DATA

AMU= 2.62848E-02(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 2.870E-01(CM/MICROSEC)

CS= 1.480E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 1.500E-04

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 2.670E-01(CM/MICROSEC)

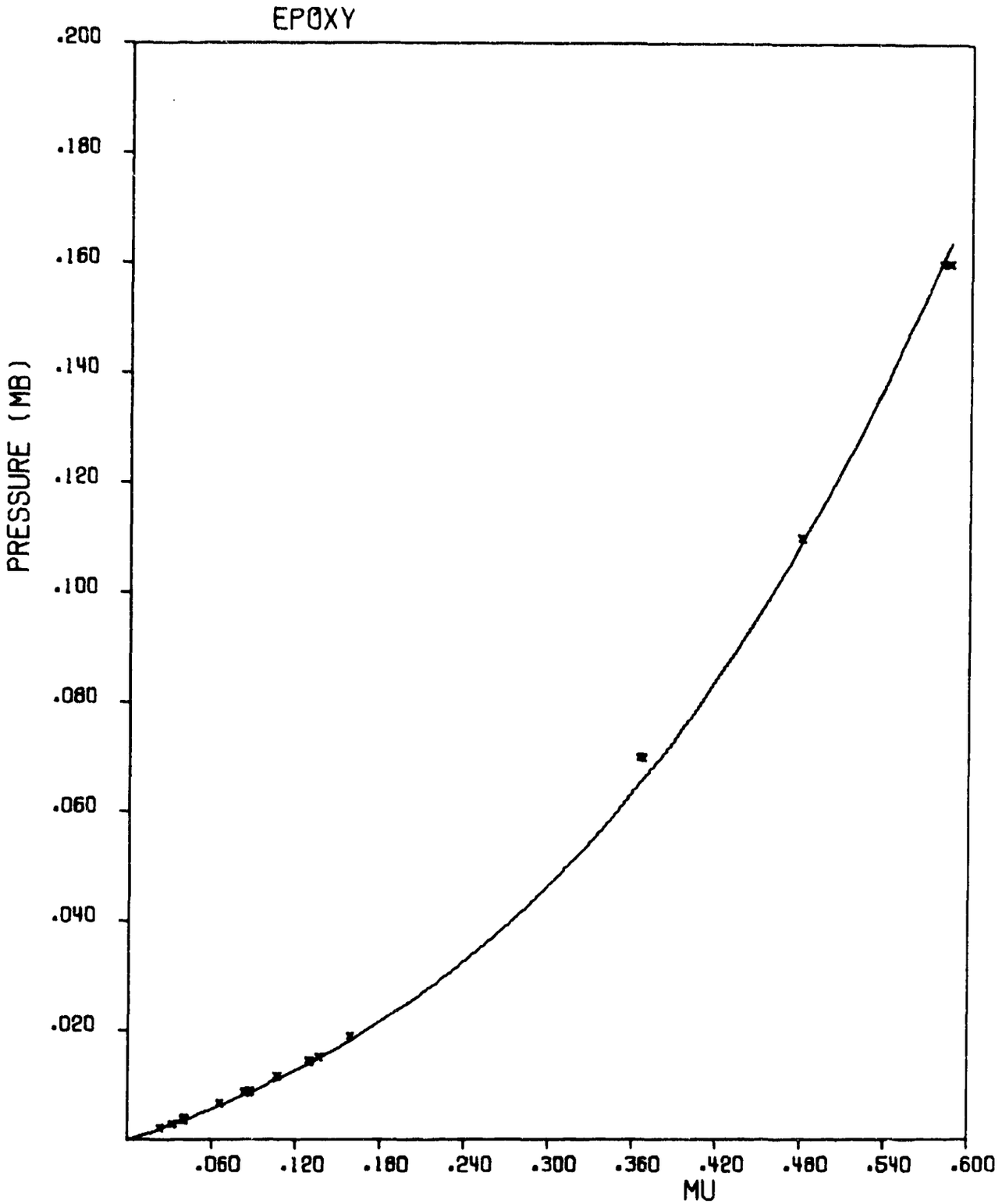
SLOPE OF US-UP= 1.5240

IN THE FIRST PLASTIC WAVE C1= .08555 * D1= .12935 S1= .34785

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.8900E-02	1.8270E-02	1.8270E-02	1.1590E+00	8.6281E-01	4.6483E-02	ETA	26
6.6700E-03	6.2667E-03	6.2667E-03	1.0656E+00	9.3844E-01	1.8498E-02	ETA	26
8.5900E-03	8.5928E-03	8.5928E-03	1.0865E+00	9.2039E-01	2.3873E-02	ETA	26
8.5500E-03	8.2704E-03	8.2704E-03	1.0837E+00	9.2276E-01	2.3459E-02	ETA	26
8.9600E-03	8.7552E-03	8.7552E-03	1.0879E+00	9.1920E-01	2.4562E-02	ETA	26
1.1700E-02	1.1023E-02	1.1023E-02	1.1067E+00	9.0359E-01	3.0660E-02	ETA	26
1.4400E-02	1.3962E-02	1.3962E-02	1.1292E+00	8.8558E-01	3.7054E-02	ETA	26
1.4450E-02	1.3962E-02	1.3962E-02	1.1292E+00	8.8558E-01	3.7118E-02	ETA	26
1.5190E-02	1.5028E-02	1.5028E-02	1.1369E+00	8.7958E-01	3.9042E-02	ETA	26
2.1500E-03	2.1140E-03	2.1140E-03	1.0238E+00	9.7675E-01	6.4537E-03	ETA	26
2.9500E-03	2.9383E-03	2.9383E-03	1.0326E+00	9.6843E-01	8.8097E-03	ETA	26
3.6100E-03	3.5634E-03	3.5634E-03	1.0391E+00	9.6237E-01	1.0640E-02	ETA	26
3.7400E-03	3.6901E-03	3.6901E-03	1.0404E+00	9.6117E-01	1.1001E-02	ETA	26
3.7800E-03	3.6901E-03	3.6901E-03	1.0404E+00	9.6117E-01	1.1060E-02	ETA	26
7.0000E-02	6.5135E-02	6.5135E-02	1.3643E+00	7.3300E-01	1.2480E-01	V/VO	20
7.0000E-02	6.5730E-02	6.5730E-02	1.3661E+00	7.3200E-01	1.2503E-01	V/VO	20
1.1000E-01	1.0901E-01	1.0901E-01	1.4793E+00	6.7600E-01	1.7234E-01	V/VO	20
1.1000E-01	1.0901E-01	1.0901E-01	1.4793E+00	6.7600E-01	1.7234E-01	V/VO	20
1.1000E-01	1.0901E-01	1.0901E-01	1.4793E+00	6.7600E-01	1.7234E-01	V/VO	20
1.6000E-01	1.6087E-01	1.6087E-01	1.5798E+00	6.3300E-01	2.2121E-01	V/VO	20
1.6000E-01	1.6382E-01	1.6382E-01	1.5848E+00	6.3100E-01	2.2181E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 9.66869E-04(MB)


EPOXY
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
PRESSURE (MB)
.060
.120
.180
.240
.300
.360
.420
.480
.540
.600
MU

CUBIC FIT TO EQUATION OF STATE FOR C-7 EPOXY

RHO(0)= 1.20000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEFF=-0. *NO DATA

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 2.650E-01(CM/MICROSEC)

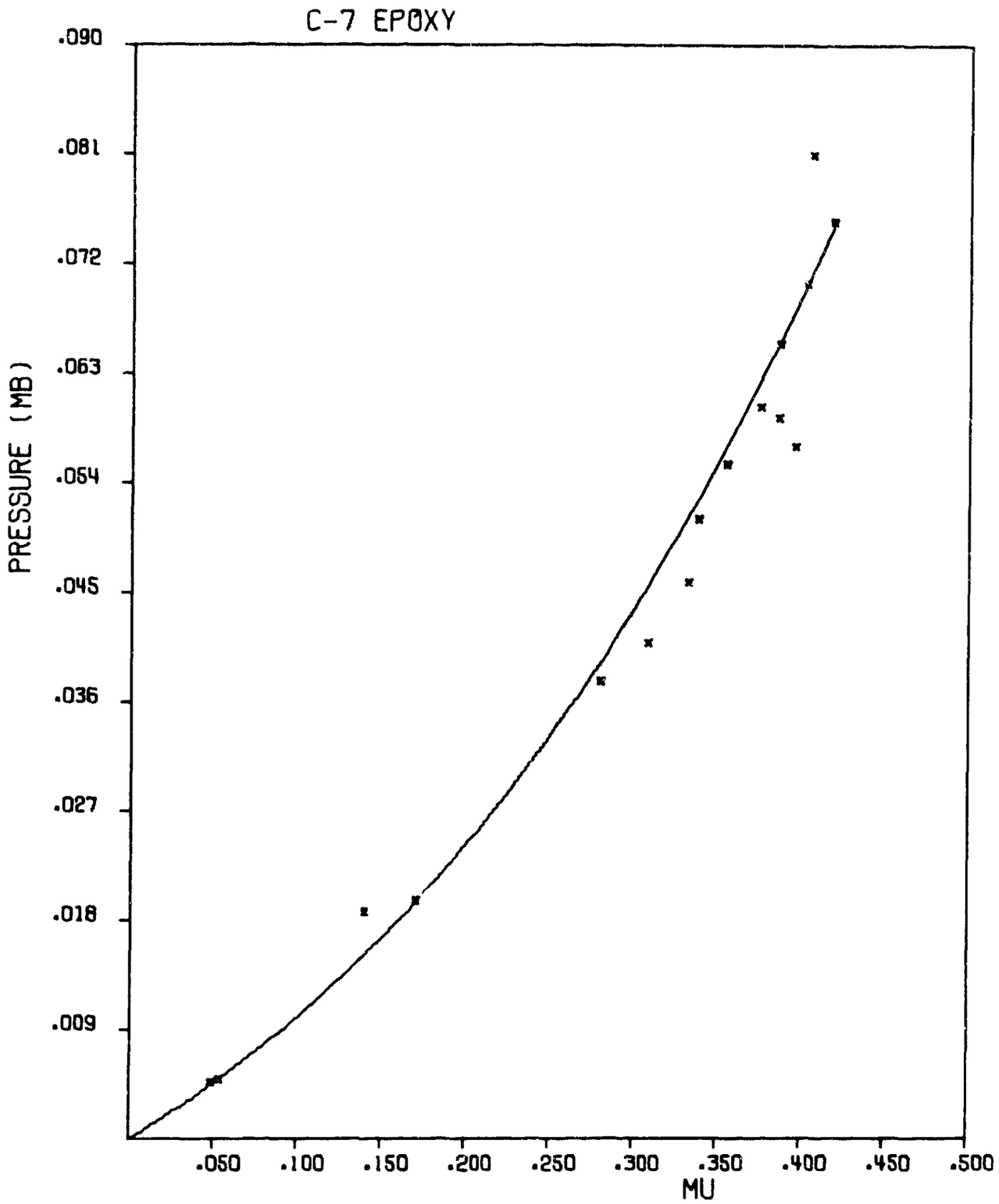
SLOPE OF US-UP= 1.4404

IN THE FIRST PLASTIC WAVE C1= .08427 * D1= .14612 S1= .19404

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.9600E-02	1.9502E-02	1.9502E-02	1.1700E+00	8.5470E-01	4.8716E-02	ETA	23
5.9400E-02	6.5460E-02	6.5460E-02	1.3860E+00	7.2150E-01	1.1741E-01	ETA	23
1.8700E-02	1.5194E-02	1.5194E-02	1.1400E+00	8.7719E-01	4.3746E-02	ETA	23
4.7100E-03	4.5029E-03	4.5029E-03	1.0490E+00	9.5329E-01	1.3540E-02	ETA	23
4.9200E-03	5.0072E-03	5.0072E-03	1.0540E+00	9.4877E-01	1.4493E-02	ETA	23
3.7700E-02	3.9398E-02	3.9398E-02	1.2804E+00	7.8100E-01	8.2947E-02	V/VO	22
4.0900E-02	4.5694E-02	4.5694E-02	1.3089E+00	7.6400E-01	8.9686E-02	V/VO	22
4.5900E-02	5.1513E-02	5.1513E-02	1.3333E+00	7.5000E-01	9.7788E-02	V/VO	22
5.1000E-02	5.2842E-02	5.2842E-02	1.3387E+00	7.4700E-01	1.0369E-01	V/VO	22
5.5500E-02	5.7016E-02	5.7016E-02	1.3550E+00	7.3800E-01	1.1008E-01	V/VO	22
6.0300E-02	6.2525E-02	6.2525E-02	1.3755E+00	7.2700E-01	1.1712E-01	V/VO	22
6.5400E-02	6.5734E-02	6.5734E-02	1.3870E+00	7.2100E-01	1.2331E-01	V/VO	22
7.0400E-02	7.0252E-02	7.0252E-02	1.4025E+00	7.1300E-01	1.2976E-01	V/VO	22
7.5400E-02	7.5064E-02	7.5064E-02	1.4184E+00	7.0500E-01	1.3615E-01	V/VO	22
8.1000E-02	7.1427E-02	7.1427E-02	1.4065E+00	7.1100E-01	1.3967E-01	V/VO	22
5.7000E-02	6.8524E-02	6.8524E-02	1.3966E+00	7.1600E-01	1.3615E-01	V/VO	22

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 3.09754E-03(MB)


C-7 EPOXY
.090
.081
.072
.063
.054
.045
.036
.027
.018
.009
PRESSURE (MB)
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR EXON

$R_M O(0)$= 1.68100

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF=-0. *NO DATA

AMU= 0. (48) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 1.948E-01(CM/MICROSEC)

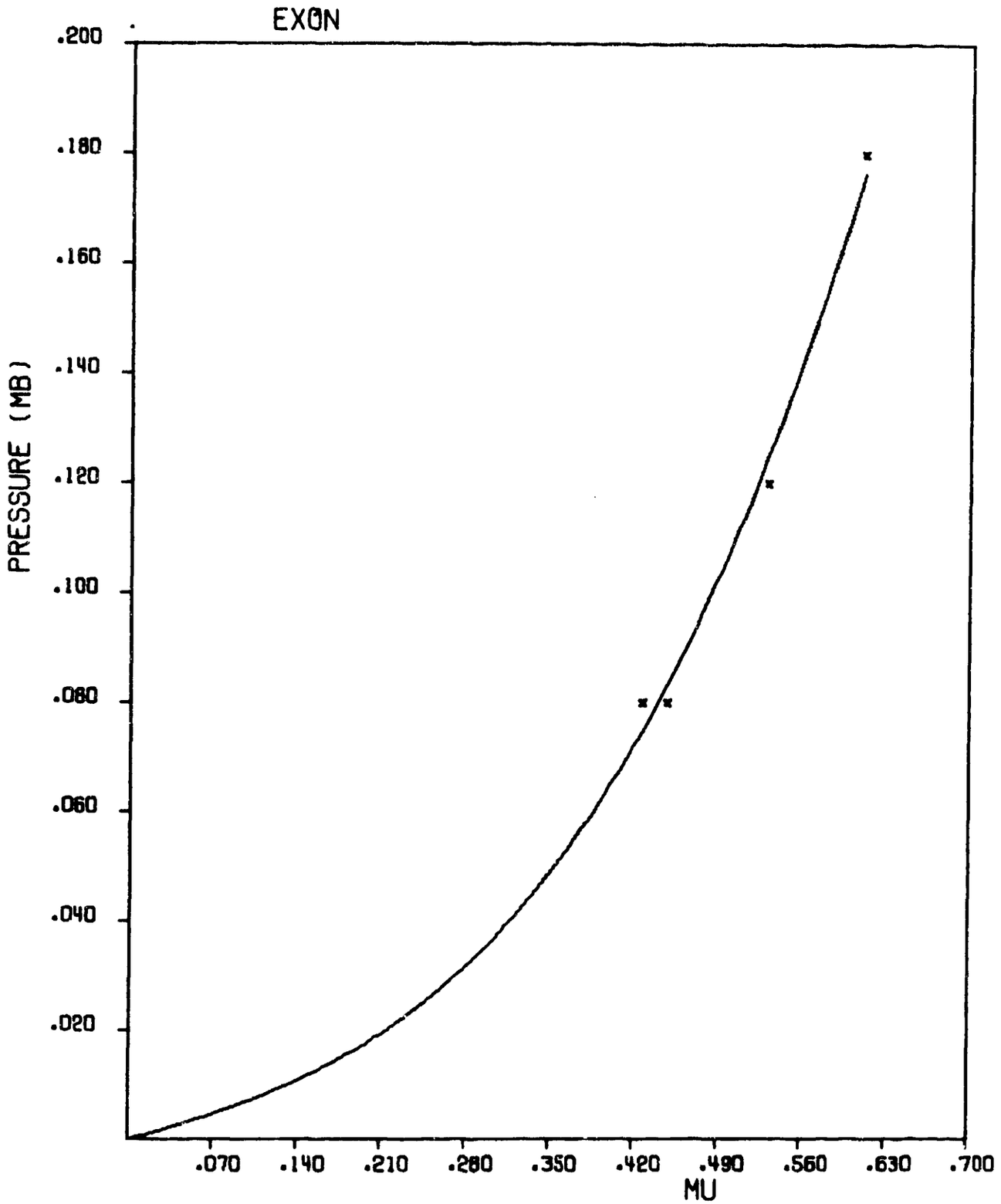
SLOPE OF US-UP= 1.6638

IN THE FIRST PLASTIC WAVE C1= .06379 * D1= .01379 S1= .58262

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
8.0000E-02	7.4928E-02	7.4928E-02	1.4265E+00	7.0100E-01	1.1929E-01	V/VO	20
8.0000E-02	8.3381E-02	8.3381E-02	1.4472E+00	6.9100E-01	1.2127E-01	V/VO	20
1.2000E-01	1.2522E-01	1.2522E-01	1.5314E+00	6.5300E-01	1.5739E-01	V/VO	20
1.8000E-01	1.7651E-01	1.7651E-01	1.6103E+00	6.2100E-01	2.0145E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 4.28980E-03(MB)


EXON
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
PRESSURE (MB)
.070
.140
.210
.280
.350
.420
.490
.560
.630
.700
MU

CUBIC FIT TO EQUATION OF STATE FOR HI-D GLASS (LOW PRESSURE)

RHO(0)= 6.20000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF=-0. *NO DATA

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

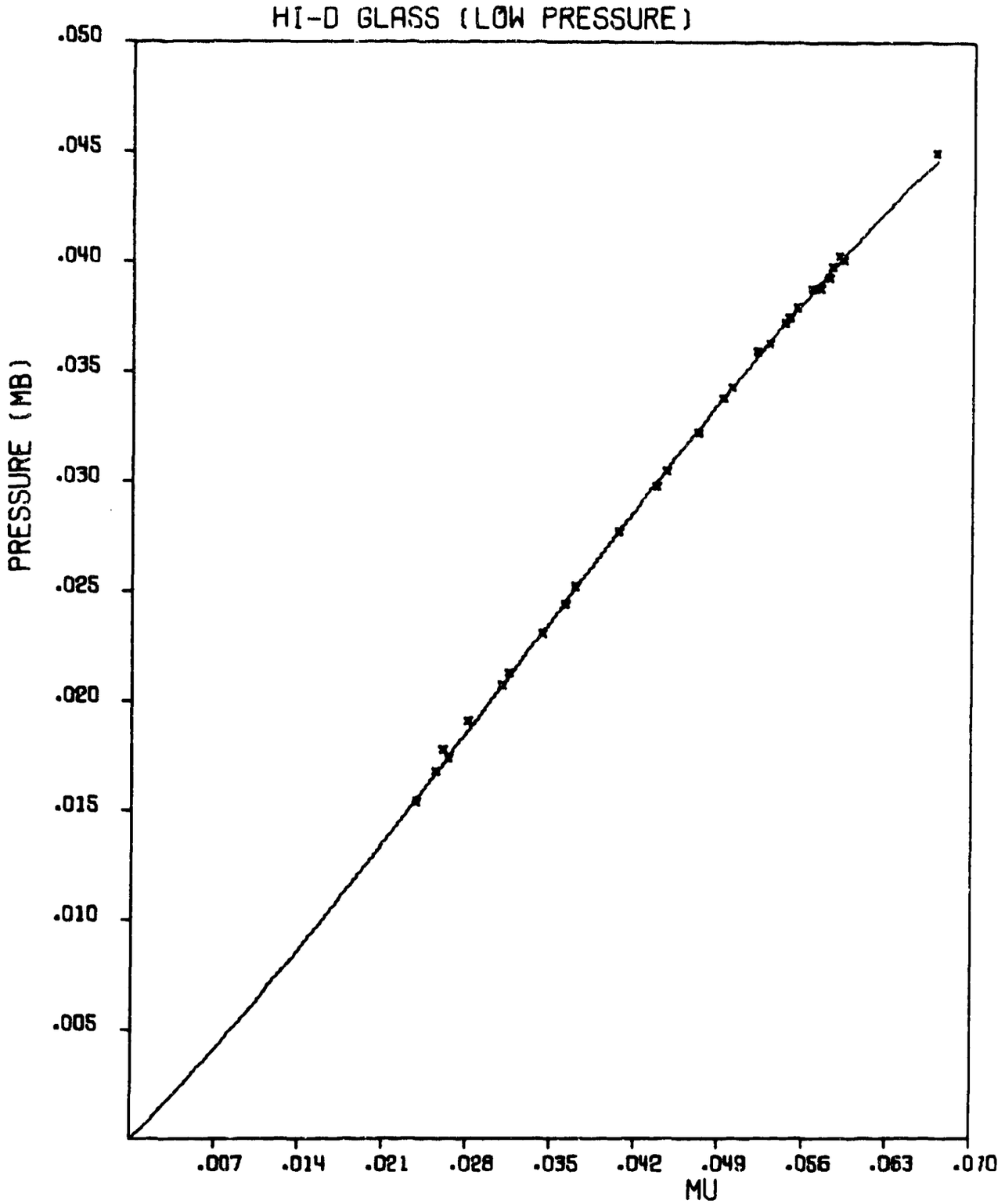
CB= 3.000E-01(CM/MICROSEC)

SLOPE OF US-UP= -0.

IN THE FIRST PLASTIC WAVE C1= .55800 * D1= 5.45226 S1= -56.97816

P(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.54000E-02	1.55286E-02	1.02370E+00	9.76849E-01	7.58320E-03	ETA	9
1.68000E-02	1.67571E-02	1.02540E+00	9.75229E-01	8.19274E-03	ETA	9
1.74000E-02	1.74828E-02	1.02640E+00	9.74279E-01	8.49615E-03	ETA	9
1.78000E-02	1.71923E-02	1.02600E+00	9.74659E-01	8.52957E-03	ETA	9
1.91000E-02	1.87207E-02	1.02810E+00	9.72668E-01	9.17606E-03	ETA	9
2.07000E-02	2.07670E-02	1.03090E+00	9.70026E-01	1.00037E-02	ETA	9
2.13000E-02	2.11329E-02	1.03140E+00	9.69556E-01	1.02269E-02	ETA	9
2.31000E-02	2.31816E-02	1.03420E+00	9.66931E-01	1.10999E-02	ETA	9
2.44000E-02	2.45686E-02	1.03610E+00	9.65158E-01	1.17099E-02	ETA	9
2.52000E-02	2.51513E-02	1.03690E+00	9.64413E-01	1.20268E-02	ETA	9
2.77000E-02	2.77570E-02	1.04050E+00	9.61076E-01	1.31871E-02	ETA	9
2.98000E-02	3.00417E-02	1.04370E+00	9.58130E-01	1.41862E-02	ETA	9
3.05000E-02	3.06069E-02	1.04450E+00	9.57396E-01	1.44770E-02	ETA	9
3.22000E-02	3.24237E-02	1.04710E+00	9.55019E-01	1.52844E-02	ETA	9
3.38000E-02	3.38657E-02	1.04920E+00	9.53107E-01	1.59888E-02	ETA	9
3.43000E-02	3.43408E-02	1.04990E+00	9.52472E-01	1.62154E-02	ETA	9
3.59000E-02	3.57473E-02	1.05200E+00	9.50570E-01	1.69179E-02	ETA	9
3.63000E-02	3.64067E-02	1.05300E+00	9.49668E-01	1.71665E-02	ETA	9
3.72000E-02	3.72529E-02	1.05430E+00	9.48497E-01	1.75790E-02	ETA	9
3.75000E-02	3.74464E-02	1.05460E+00	9.48227E-01	1.76959E-02	ETA	9
3.79000E-02	3.78313E-02	1.05520E+00	9.47688E-01	1.78824E-02	ETA	9
3.88000E-02	3.86553E-02	1.05650E+00	9.46522E-01	1.82940E-02	ETA	9
3.98000E-02	3.97112E-02	1.05820E+00	9.45001E-01	1.87898E-02	ETA	9
4.03000E-02	4.00777E-02	1.05880E+00	9.44465E-01	1.89993E-02	ETA	9
3.88000E-02	3.90931E-02	1.05720E+00	9.45895E-01	1.84009E-02	ETA	9
3.93000E-02	3.95267E-02	1.05790E+00	9.45269E-01	1.86259E-02	ETA	9
4.01000E-02	4.03203E-02	1.05920E+00	9.44109E-01	1.90129E-02	ETA	9
4.50000E-02	4.46198E-02	1.06680E+00	9.37383E-01	2.13185E-02	ETA	9

* IMPLIES LINEAR TERM IS IMPOSED.


HI-D GLASS (LOW PRESSURE)
PRESSURE (MB)
.050
.045
.040
.035
.030
.025
.020
.015
.010
.005
.007
.014
.021
.028
.035
.042
.049
.056
.063
.070
MU

CUBIC FIT TO EQUATION OF STATE FOR GOLD

RHO(0)= 19.24000

SURLIMATION ENERGY= 1.76830E+10

GRUNFISEN COEF= 2.8000

AMU= 2.91082E-01(MB)

YO = 1.39000E-03(MB)

YMU= 2.38764E-03

HUGONIOT ELASTIC LIMIT = 5.47621E-03(MB)

CL= 3.280E-01(CM/MICROSEC)

CS= 1.230E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 4.040E-05

SPECIFIC HEAT(CP)= 1.260E+06

CB= 3.147E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.4968

IN THE ELASTIC WAVE C0= 2.29356

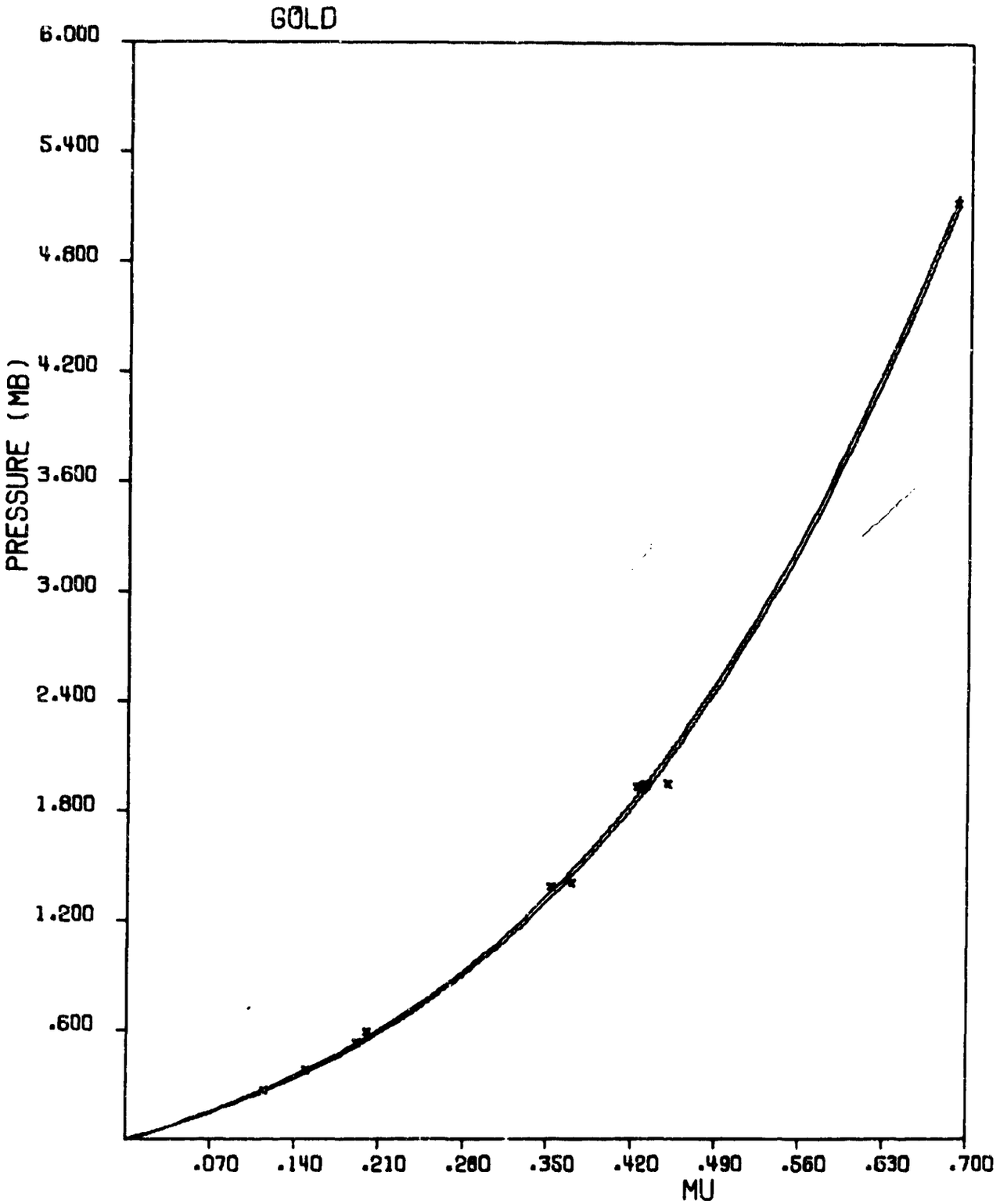
IN THE FIRST PLASTIC WAVE C1= 1.90545 * D1= 2.40094 S1= 8.11259

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.6900E-01	2.7354E-01	2.6377E-01	1.1152E+00	8.9670E-01	3.8004E-02	V/VO	13
3.7540E-01	3.8086E-01	3.6833E-01	1.1504E+00	8.6930E-01	5.0499E-02	V/VO	13
5.2920E-01	5.2771E-01	5.1191E-01	1.1920E+00	8.3890E-01	6.6566E-02	V/VO	13
5.9000E-01	5.6033E-01	5.4387E-01	1.2005E+00	8.3300E-01	7.1562E-02	V/VO	15
1.3870E+00	1.3583E+00	1.3298E+00	1.3532E+00	7.3900E-01	1.3717E-01	V/VO	5
1.4100E+00	1.4734E+00	1.4437E+00	1.3699E+00	7.3000E-01	1.4067E-01	V/VO	5
1.9310E+00	1.9305E+00	1.8962E+00	1.4286E+00	7.0000E-01	1.7352E-01	V/VO	5
1.9320E+00	1.8961E+00	1.8621E+00	1.4245E+00	7.0200E-01	1.7299E-01	V/VO	5
1.9360E+00	1.9480E+00	1.9135E+00	1.4306E+00	6.9900E-01	1.7403E-01	V/VO	5
1.9420E+00	1.9480E+00	1.9135E+00	1.4306E+00	6.9900E-01	1.7430E-01	V/VO	5
1.9500E+00	2.1124E+00	2.0764E+00	1.4493E+00	6.9000E-01	1.7725E-01	V/VO	15
5.1300E+00	5.1641E+00	5.1093E+00	1.6892E+00	5.9200E-01	3.2983E-01	V/VO	15

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 3.84915E-02(MB)

YADD AT .2MU = 2.324E-02


GOLD
6.000
5.400
4.800
4.200
3.600
3.000
2.400
1.800
1.200
.600
PRESSURE (MB)
.070
.140
.210
.280
.350
.420
.490
.560
.630
.700
MU

CUBIC FIT TO EQUATION OF STATE FOR GRAPHITE COMMERCIAL

RHO(0)= 1.62400

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF=-0. *NO DATA

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 1.477E-01(CM/MICROSEC)

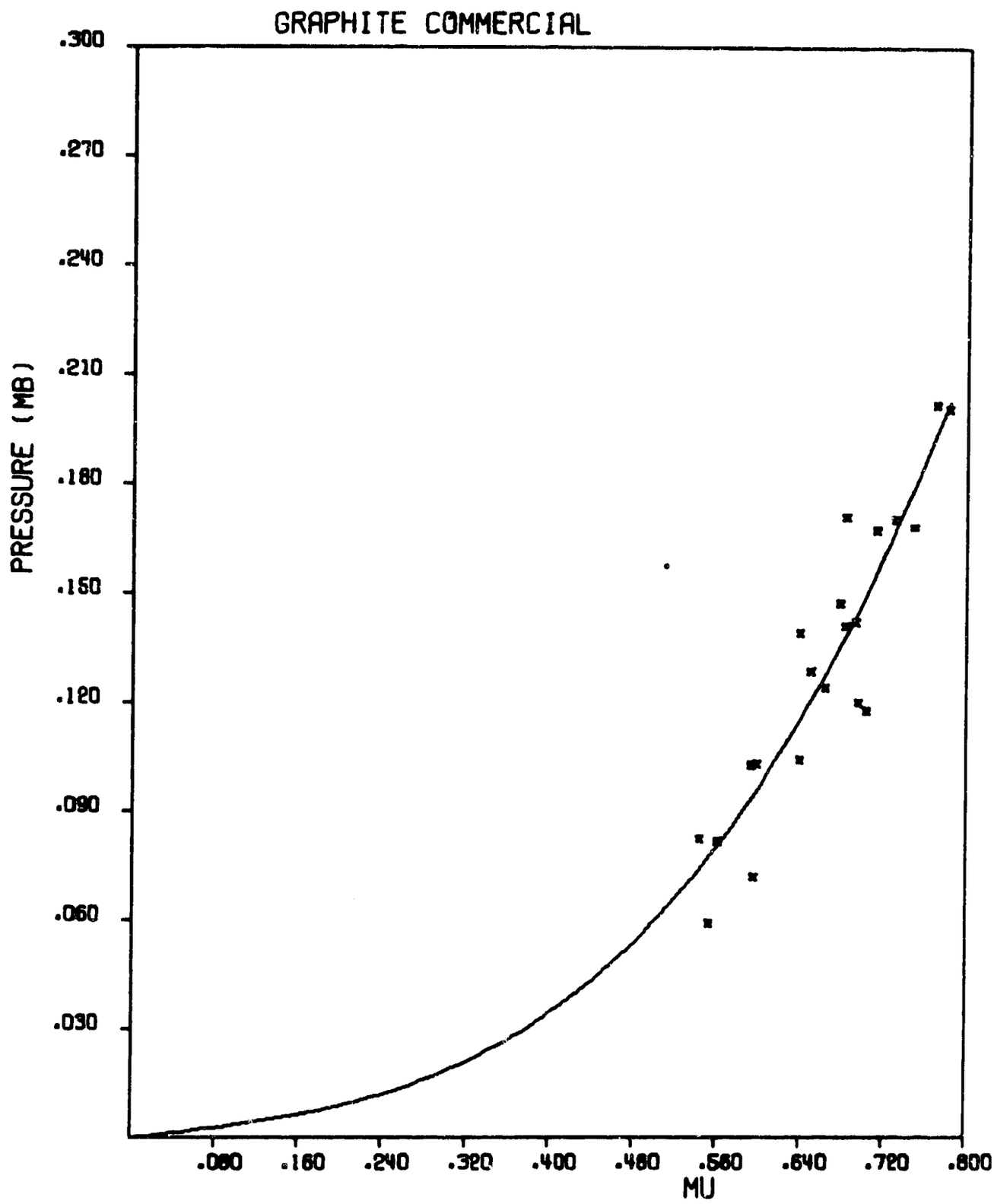
SLOPE OF US-UP= -0.

IN THE FIRST PLASTIC WAVE C1= .03552 * D1= -.03953 S1= .41540

P(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.00500E-01	2.02644E-01	1.78253E+00	5.61000E-01	2.32521E-01	V/VO	42
2.01500E-01	1.93494E-01	1.76991E+00	5.65000E-01	2.32036E-01	V/VO	42
1.67000E-01	1.55388E-01	1.71233E+00	5.84000E-01	2.06575E-01	V/VO	42
1.68000E-01	1.78470E-01	1.74825E+00	5.72000E-01	2.10160E-01	V/VO	42
1.70000E-01	1.66529E-01	1.73010E+00	5.78000E-01	2.09920E-01	V/VO	42
1.71000E-01	1.38454E-01	1.68350E+00	5.94000E-01	2.06507E-01	V/VO	42
1.42000E-01	1.43330E-01	1.69205E+00	5.91000E-01	1.88877E-01	V/VO	42
1.41000E-01	1.38454E-01	1.68350E+00	5.94000E-01	1.87519E-01	V/VO	42
1.47000E-01	1.35295E-01	1.67785E+00	5.96000E-01	1.90995E-01	V/VO	42
1.39000E-01	1.15111E-01	1.63934E+00	6.10000E-01	1.82479E-01	V/VO	42
1.20000E-01	1.44994E-01	1.69492E+00	5.90000E-01	1.73842E-01	V/VO	42
1.17500E-01	1.50101E-01	1.70358E+00	5.87000E-01	1.72650E-01	V/VO	42
1.28500E-01	1.20550E-01	1.65017E+00	6.06000E-01	1.76349E-01	V/VO	42
1.24000E-01	1.27710E-01	1.66389E+00	6.01000E-01	1.74329E-01	V/VO	42
1.03000E-01	9.56955E-02	1.59744E+00	6.26000E-01	1.53825E-01	V/VO	42
1.04000E-01	1.15111E-01	1.63934E+00	6.10000E-01	1.57842E-01	V/VO	42
1.02500E-01	9.35103E-02	1.59236E+00	6.28000E-01	1.53040E-01	V/VO	42
8.15000E-02	8.04687E-02	1.56006E+00	6.41000E-01	1.34060E-01	V/VO	42
8.25000E-02	7.42136E-02	1.54321E+00	6.48000E-01	1.33558E-01	V/VO	42
7.20000E-02	9.45966E-02	1.59490E+00	6.27000E-01	1.28438E-01	V/VO	42
5.90000E-02	7.77261E-02	1.55280E+00	6.44000E-01	1.13586E-01	V/VO	42

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.21439E-02(MB)


GRAPHITE COMMERCIAL
.300
.270
.240
.210
.180
.150
.120
.090
.060
.030
PRESSURE (MB)
.080
.160
.240
.320
.400
.480
.560
.640
.720
.800
MU

CUBIC FIT TO EQUATION OF STATE FOR PYROLYTIC GRAPHITE

$R_{H}O(0)$= 2.20000

SUBLIMATION ENERGY= 8.00000E+09

GRUNEISEN COEF= .8800

AMU= 0. (MB) *NO DATA

Y0 =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 7.800E-05

SPECIFIC HEAT(CP)= 9.630E+07

CB= 4.145E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.7341

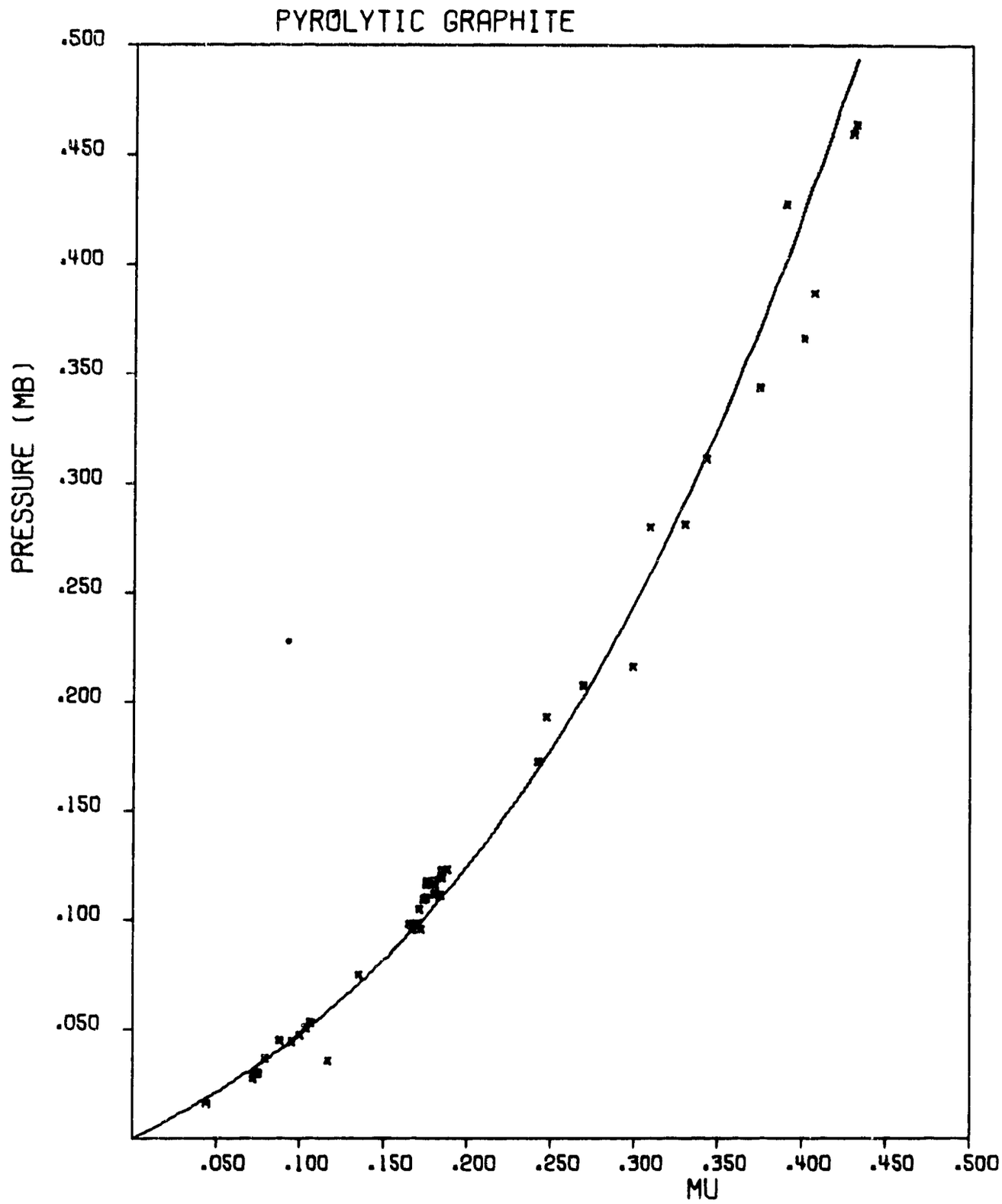
IN THE FIRST PLASTIC WAVE C1= .37798 * D1= .73713 S1= 2.42668

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/V0	U(CM/MICROSEC)	INPUT	REFERENCE
2.8100E-01	2.9186E-01	2.9186E-01	1.3298E+00	7.5200E-01	1.7798E-01	V/V0	35
1.9300E-01	1.7476E-01	1.7476E-01	1.2469E+00	8.0200E-01	1.3180E-01	V/V0	35
1.2200E-01	1.1037E-01	1.1037E-01	1.1848E+00	8.4400E-01	9.3010E-02	V/V0	35
9.8000E-02	9.3748E-02	9.3748E-02	1.1655E+00	8.5800E-01	7.9533E-02	V/V0	35
1.1800E-01	1.0663E-01	1.0663E-01	1.1806E+00	8.4700E-01	9.0589E-02	V/V0	35
1.2300E-01	1.1292E-01	1.1292E-01	1.1876E+00	8.4200E-01	9.3987E-02	V/V0	35
2.0700E-01	2.0230E-01	2.0230E-01	1.2690E+00	7.8800E-01	1.4123E-01	V/V0	35
2.8000E-01	2.5862E-01	2.5862E-01	1.3089E+00	7.6400E-01	1.7331E-01	V/V0	35
1.1900E-01	1.1037E-01	1.1037E-01	1.1848E+00	8.4400E-01	9.1860E-02	V/V0	35
1.1700E-01	1.0180E-01	1.0180E-01	1.1751E+00	8.5100E-01	8.9017E-02	V/V0	35
3.5500E-02	5.8408E-02	5.8408E-02	1.1173E+00	8.9500E-01	4.1162E-02	V/V0	35
2.7200E-02	3.1843E-02	3.1843E-02	1.0718E+00	9.3300E-01	2.8781E-02	V/V0	35
2.9400E-02	3.3661E-02	3.3661E-02	1.0753E+00	9.3000E-01	3.0585E-02	V/V0	35
7.5000E-02	7.0485E-02	7.0485E-02	1.1351E+00	8.8100E-01	6.3693E-02	V/V0	35
1.5700E-02	1.8692E-02	1.8692E-02	1.0449E+00	9.5700E-01	1.7518E-02	V/V0	35
1.0500E-01	9.8290E-02	9.8290E-02	1.1710E+00	8.5400E-01	8.3476E-02	V/V0	35
9.8000E-02	9.7139E-02	9.7139E-02	1.1696E+00	8.5500E-01	8.0368E-02	V/V0	35
4.7200E-02	4.7662E-02	4.7662E-02	1.1001E+00	9.0900E-01	4.4186E-02	V/V0	35
4.3900E-02	4.4811E-02	4.4811E-02	1.0953E+00	9.1300E-01	4.1666E-02	V/V0	35
1.1590E-01	1.0663E-01	1.0663E-01	1.1806E+00	8.4700E-01	8.9779E-02	V/V0	41
1.1590E-01	1.0180E-01	1.0180E-01	1.1751E+00	8.5100E-01	8.8598E-02	V/V0	41
1.0890E-01	1.0062E-01	1.0062E-01	1.1737E+00	8.5200E-01	8.5592E-02	V/V0	41
1.0950E-01	1.0180E-01	1.0180E-01	1.1751E+00	8.5100E-01	8.6117E-02	V/V0	41
9.5500E-02	9.4868E-02	9.4868E-02	1.1669E+00	8.5700E-01	7.8726E-02	V/V0	41
5.0300E-02	4.9862E-02	4.9862E-02	1.1038E+00	9.0600E-01	4.6359E-02	V/V0	41
2.9700E-02	3.3051E-02	3.3051E-02	1.0741E+00	9.3100E-01	3.0520E-02	V/V0	41
4.4600E-02	4.0703E-02	4.0703E-02	1.0881E+00	9.1900E-01	4.0523E-02	V/V0	41
5.2700E-02	5.1359E-02	5.1359E-02	1.1062E+00	9.0400E-01	4.7955E-02	V/V0	41
3.6600E-02	3.6152E-02	3.6152E-02	1.0799E+00	9.2600E-01	3.5087E-02	V/V0	41
1.1140E-01	1.0663E-01	1.0663E-01	1.1806E+00	8.4700E-01	8.8019E-02	V/V0	41
1.1090E-01	1.0911E-01	1.0911E-01	1.1834E+00	8.4500E-01	8.8393E-02	V/V0	41
9.5500E-02	9.9451E-02	9.9451E-02	1.1723E+00	8.5300E-01	7.9882E-02	V/V0	41
2.1600E-01	2.4335E-01	2.4335E-01	1.2987E+00	7.7000E-01	1.5027E-01	V/V0	41
1.7250E-01	1.6931E-01	1.6931E-01	1.2422E+00	8.0500E-01	1.2365E-01	V/V0	41
3.8660E-01	4.3839E-01	4.3839E-01	1.4065E+00	7.1100E-01	2.2536E-01	V/V0	41
4.6330E-01	4.9322E-01	4.9322E-01	1.4306E+00	6.9900E-01	2.5177E-01	V/V0	41
4.5900E-01	4.8841E-01	4.8841E-01	1.4286E+00	7.0000E-01	2.5018E-01	V/V0	41
3.1120E-01	3.1305E-01	3.1305E-01	1.3423E+00	7.4500E-01	1.8992E-01	V/V0	41

3.6580E-01	4.2564E-01	4.2564E-01	1.4006E+00	7.1400E-01	2.1807E-01	V/V0	41
4.2700E-01	4.0119E-01	4.0119E-01	1.3889E+00	7.2030E-01	2.3312E-01	V/V0	41
3.4320E-01	3.7069E-01	3.7069E-01	1.3736E+00	7.2800E-01	2.0599E-01	V/V0	41

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.17363E-02(MB)


PYROLYTIC GRAPHITE
PRESSURE (MB)
.500
.450
.400
.350
.300
.250
.200
.150
.100
.050
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR HAFNIUM

RHO(0)= 13.31000

SUBLIMATION ENERGY= 3.90600E+10

GRUNEISEN COEF= 1.0400

AMU= 5.99205E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 3.860E-01(CM/MICROSEC)

CS= 2.120E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 1.800E-05

SPECIFIC HEAT(CP)= 2.551E+06

CB= 2.950E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.1210

IN THE FIRST PLASTIC WAVE C1= 1.15830 * D1= 1.43697 S1= .35148

IN THE SECOND PLASTIC WAVE C2= .92469 * D2= 3.14275 S2= .16017

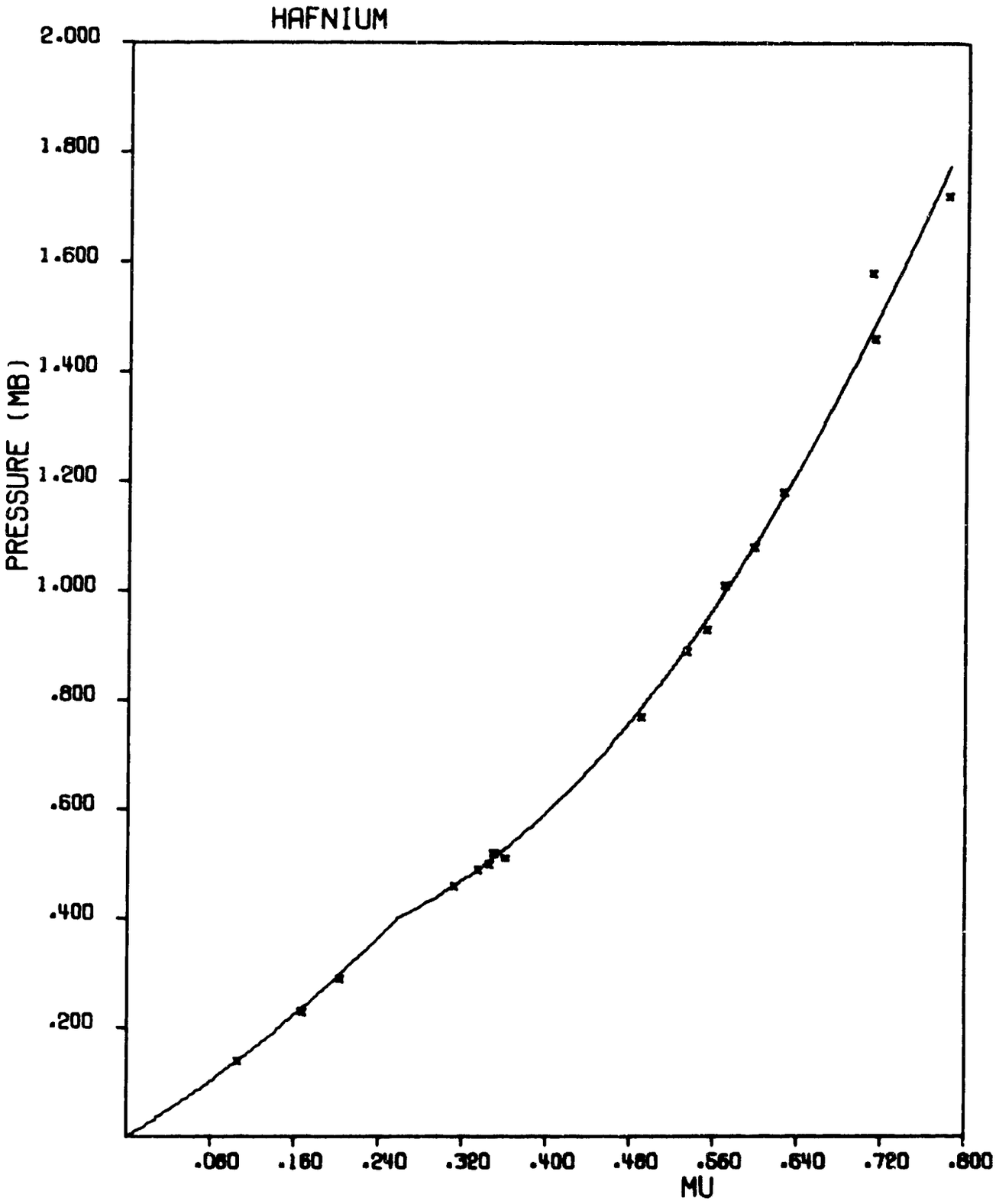
INFLECTION POINT PRESSURE(MB) = 4.00000E-01 MU = .25800

CR = .2350 SLOPE = -0. RHO = 16.7440

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.4000E-01	1.3963E-01	1.3963E-01	1.1062E+00	9.0400E-01	3.1777E-02	V/VO	20
2.3000E-01	2.3492E-01	2.3492E-01	1.1669E+00	8.5700E-01	4.9710E-02	V/VO	20
2.3000E-01	2.3492E-01	2.3492E-01	1.1669E+00	8.5700E-01	4.9710E-02	V/VO	20
2.9000E-01	2.9795E-01	2.9795E-01	1.2034E+00	8.3100E-01	6.0681E-02	V/VO	20
4.6000E-01	4.5955E-01	4.5955E-01	1.3123E+00	7.6200E-01	9.0694E-02	V/VO	20
4.9000E-01	4.9007E-01	4.9007E-01	1.3351E+00	7.4900E-01	9.6127E-02	V/VO	20
5.0000E-01	5.0567E-01	5.0567E-01	1.3459E+00	7.4300E-01	9.8257E-02	V/VO	20
5.1000E-01	5.2805E-01	5.2805E-01	1.3605E+00	7.3500E-01	1.0077E-01	V/VO	20
5.2000E-01	5.1109E-01	5.1109E-01	1.3495E+00	7.4100E-01	1.0059E-01	V/VO	20
7.7000E-01	7.8654E-01	7.8654E-01	1.4903E+00	6.7100E-01	1.3796E-01	V/VO	20
8.9000E-01	8.9746E-01	8.9746E-01	1.5337E+00	6.5200E-01	1.5254E-01	V/VO	20
9.3000E-01	9.5002E-01	9.5002E-01	1.5528E+00	6.4400E-01	1.5772E-01	V/VO	20
1.0100E+00	9.9912E-01	9.9912E-01	1.5699E+00	6.3700E-01	1.6597E-01	V/VO	20
1.0800E+00	1.0826E+00	1.0826E+00	1.5974E+00	6.2600E-01	1.7420E-01	V/VO	20
1.1800E+00	1.1743E+00	1.1743E+00	1.6260E+00	6.1500E-01	1.8475E-01	V/VO	20
1.4600E+00	1.4846E+00	1.4846E+00	1.7123E+00	5.8400E-01	2.1362E-01	V/VO	20
1.5800E+00	1.4733E+00	1.4733E+00	1.7094E+00	5.8500E-01	2.2195E-01	V/VO	20
1.7200E+00	1.7740E+00	1.7740E+00	1.7825E+00	5.6100E-01	2.3818E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.66530E-02(MB)


HAFNIUM
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.080
.160
.240
.320
.400
.480
.560
.640
.720
.800
MU

CUBIC FIT TO EQUATION OF STATE FOR ARMCO IRON

RHO(G)= 7.8500

SUBLIMATION ENERGY= 7.36000E+10

GRUNEISEN COEF= 1.6900

AMU= 8.18943E-01(MB)

YO = 7.94061E-03(MB)

YMU= 4.84785E-03

HUGONIOT ELASTIC LIMIT = 1.30000E-02(MB)

CL= 5.860E-01(CM/MICROSEC)

CS= 3.230E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 3.510E-03

SPECIFIC HEAT(CP)= 2.503E+08

CB= 4.500E-01(CM/MICROSEC)

SLOPE OF US-UP= 3.1416

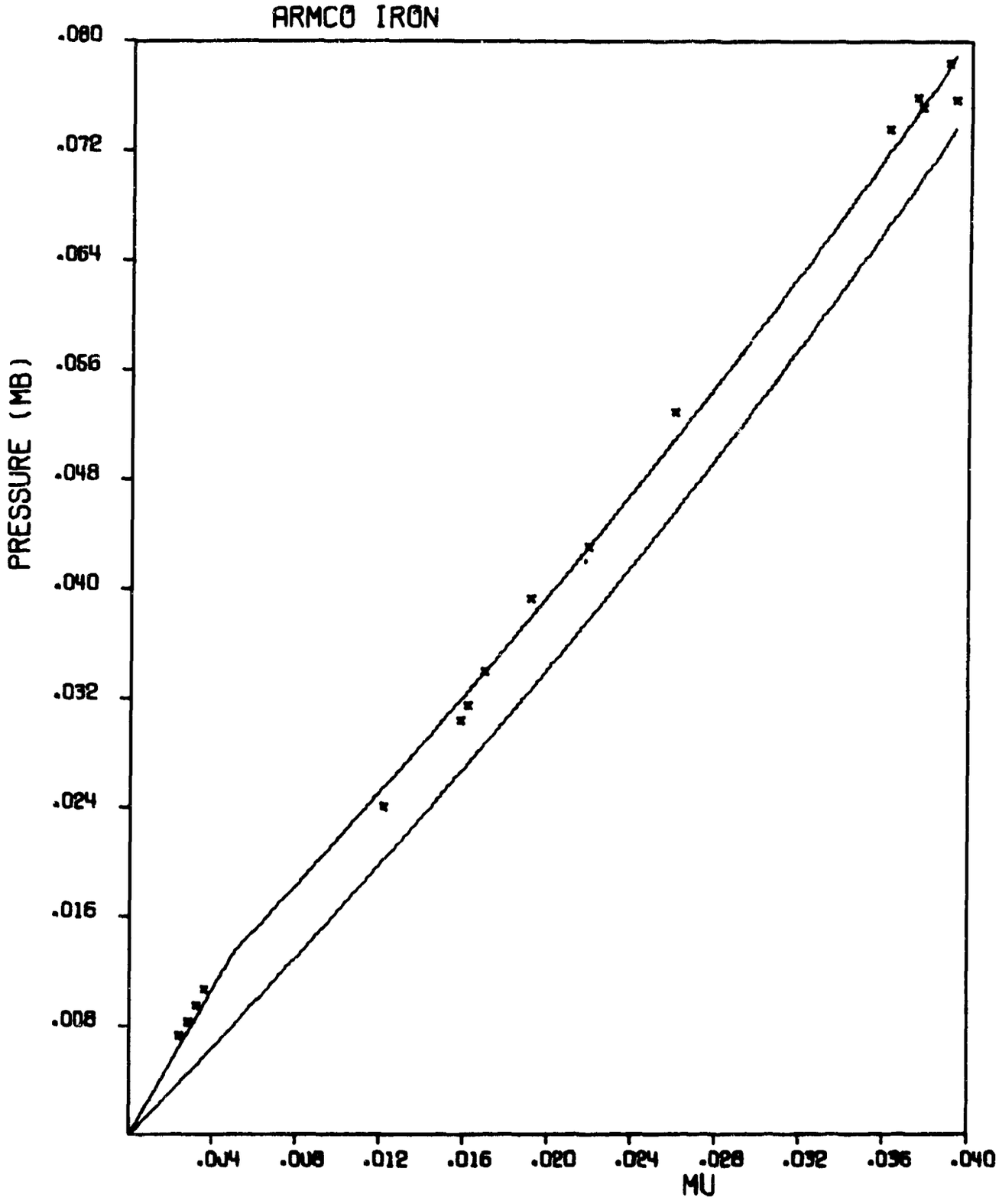
IN THE ELASTIC WAVE C0= 2.68160

IN THE FIRST PLASTIC WAVE C1= 1.58962 * D1= 5.16968 S1= 51.76727

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.0670E-02	9.6886E-03	5.7433E-03	1.0036E+00	9.9640E-01	2.2121E-03	V/VO	21
9.4600E-03	8.6087E-03	5.1031E-03	1.0032E+00	9.9680E-01	1.9637E-03	V/VO	21
7.2800E-03	6.4513E-03	3.8243E-03	1.0024E+00	9.9760E-01	1.4919E-03	V/VO	21
8.2500E-03	7.5296E-03	4.4634E-03	1.0028E+00	9.9720E-01	1.7154E-03	V/VO	21
2.4100E-02	2.5456E-02	2.0163E-02	1.0121E+00	9.8800E-01	6.0697E-03	V/VO	21
3.0400E-02	3.1989E-02	2.6695E-02	1.0158E+00	9.8440E-01	7.7726E-03	V/VO	21
3.1500E-02	3.2545E-02	2.7251E-02	1.0162E+00	9.8410E-01	7.9876E-03	V/VO	21
3.4000E-02	3.4036E-02	2.8742E-02	1.0170E+00	9.8330E-01	8.5048E-03	V/VO	21
3.9300E-02	3.8013E-02	3.2720E-02	1.0192E+00	9.8120E-01	9.7015E-03	V/VO	21
4.3100E-02	4.3069E-02	3.7775E-02	1.0219E+00	9.7860E-01	1.0840E-02	V/VO	21
5.2900E-02	5.0944E-02	4.5650E-02	1.0260E+00	9.7470E-01	1.3057E-02	V/VO	21
7.3600E-02	7.1986E-02	6.6692E-02	1.0362E+00	9.6510E-01	1.8089E-02	V/VO	21
7.5200E-02	7.5272E-02	6.9978E-02	1.0377E+00	9.6370E-01	1.8648E-02	V/VO	21
7.5700E-02	7.8859E-02	7.3565E-02	1.0393E+00	9.6220E-01	1.9092E-02	V/VO	21
7.5900E-02	7.4799E-02	6.9505E-02	1.0375E+00	9.6390E-01	1.8683E-02	V/VO	21
7.8400E-02	7.8136E-02	7.2842E-02	1.0390E+00	9.6250E-01	1.9353E-02	V/VO	21

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.05576E-03(MB)


ARMCO IRON
PRESSURE (MB)
.080
.072
.064
.056
.048
.040
.032
.024
.016
.008
.004
.008
.012
.016
.020
.024
.028
.032
.036
.040
MU

CUBIC FIT TO EQUATION OF STATE FOR IRON

RHO(0)= 7.85000

SUBLIMATION ENERGY= 7.36000E+10 CL= 5.860E-01(CM/MICROSEC)

GRUNEISEN COEF= 1.6400 CS= 3.230E-01(CM/MICROSEC)

AMU= 8.1[illegible]83E-01(MB) THERMAL COEF OF EXPANSION(VOL)= 3.510E-05

YO = 7.94061E-03(MB) SPECIFIC HEAT(CP)= 2.503E+08

YMU= 4.84785E-03 CB= 4.500E-01(CM/MICROSEC)

HUGONIOT ELASTIC LIMIT = 1.30000E-02(MB) SLOPE OF US-UP= 3.1416

IN THE ELASTIC WAVE C0= 2.68160

IN THE FIRST PLASTIC WAVE C1= 1.58962 * D1= 5.16968 S1= 51.76727

IN THE SECOND PLASTIC WAVE C2= 1.01932 * D2= 4.21968 S2= 5.12915

INFLECTION POINT PRESSURE(MB) = 1.30000E-01 MU = .06000

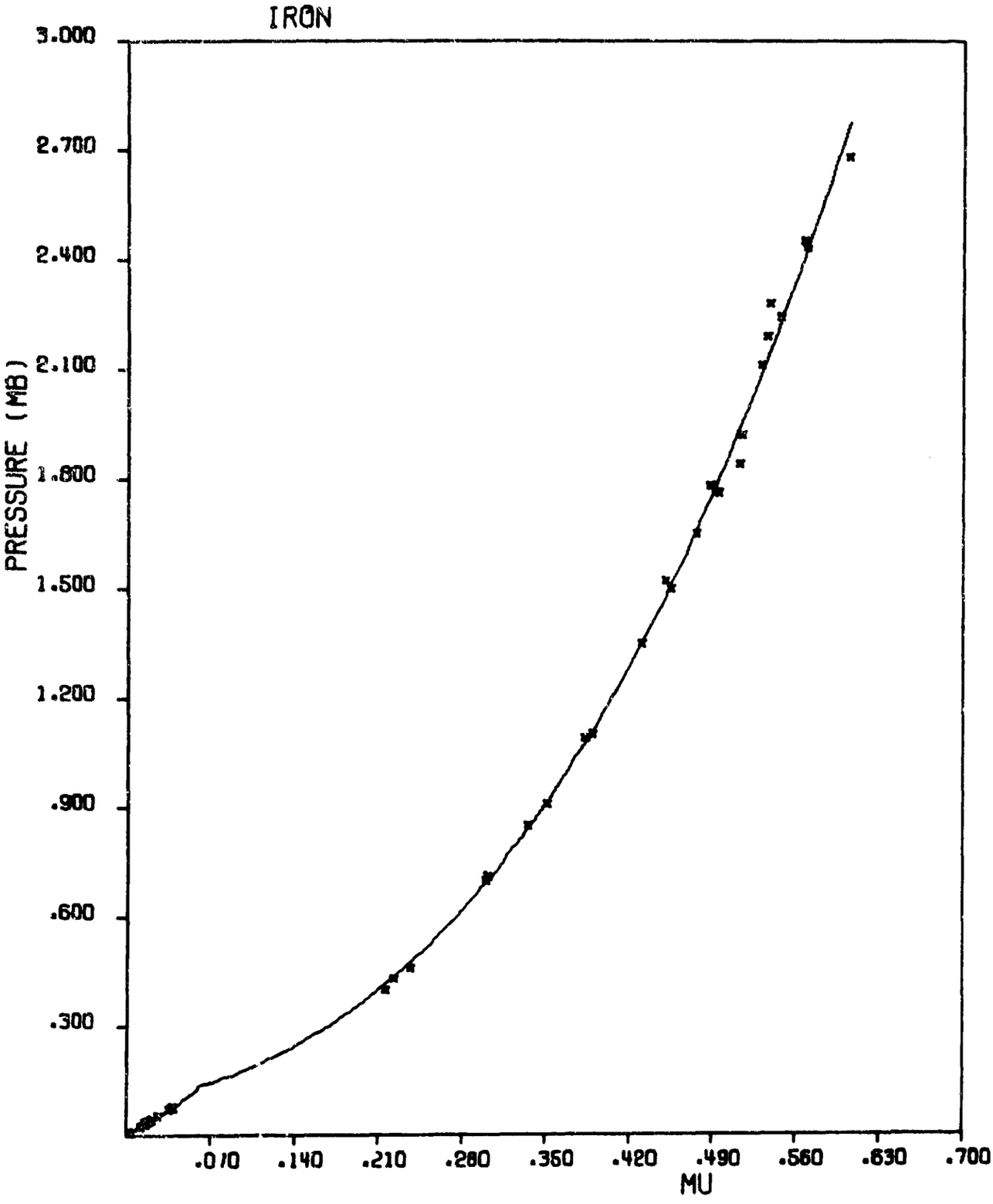
CB = .3500 SLOPE = -0. RHO = 8.3210

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.0670E-02	9.6886E-03	5.7433E-03	1.0036E+00	9.9640E-01	2.2121E-03	V/VO	21
9.4600E-03	8.6087E-03	5.1031E-03	1.0032E+00	9.9680E-01	1.9637E-03	V/VO	21
7.2800E-03	6.4513E-03	3.8243E-03	1.0024E+00	9.9760E-01	1.4919E-03	V/VO	21
8.2500E-03	7.5296E-03	4.4634E-03	1.0028E+00	9.9720E-01	1.7154E-03	V/VO	21
2.4100E-02	2.5456E-02	2.0163E-02	1.0121E+00	9.8800E-01	6.0697E-03	V/VO	21
3.0400E-02	3.1989E-02	2.6695E-02	1.0158E+00	9.8440E-01	7.7726E-03	V/VO	21
3.1500E-02	3.2545E-02	2.7251E-02	1.0162E+00	9.8410E-01	7.9876E-03	V/VO	21
3.4000E-02	3.4036E-02	2.8742E-02	1.0170E+00	9.8330E-01	8.5048E-03	V/VO	21
3.9300E-02	3.8013E-02	3.2720E-02	1.0192E+00	9.8120E-01	9.7015E-03	V/VO	21
4.3100E-02	4.3069E-02	3.7775E-02	1.0219E+00	9.7860E-01	1.0840E-02	V/VO	21
5.2900E-02	5.0934E-02	4.5650E-02	1.0260E+00	9.7470E-01	1.3057E-02	V/VO	21
7.3600E-02	7.1986E-02	6.6692E-02	1.0362E+00	9.6510E-01	1.8089E-02	V/VO	21
7.5200E-02	7.5272E-02	6.9978E-02	1.0377E+00	9.6370E-01	1.8648E-02	V/VO	21
7.5700E-02	7.8859E-02	7.3565E-02	1.0393E+00	9.6220E-01	1.9092E-02	V/VO	21
7.5900E-02	7.4799E-02	6.9505E-02	1.0375E+00	9.6390E-01	1.8683E-02	V/VO	21
7.8400E-02	7.8136E-02	7.2842E-02	1.0390E+00	9.6250E-01	1.9353E-02	V/VO	21
4.0000E-01	4.1795E-01	4.1266E-01	1.2165E+00	8.2200E-01	9.5237E-02	V/VO	20
4.3000E-01	4.3855E-01	4.3326E-01	1.2240E+00	8.1700E-01	1.0012E-01	V/VO	20
4.6000E-01	4.7823E-01	4.7293E-01	1.2376E+00	8.0800E-01	1.0607E-01	V/VO	20
7.0000E-01	6.9543E-01	6.9013E-01	1.3006E+00	7.6900E-01	1.4352E-01	V/VO	20
7.1000E-01	7.0211E-01	6.9682E-01	1.3021E+00	7.6800E-01	1.4486E-01	V/VO	20
8.5000E-01	8.4190E-01	8.3661E-01	1.3351E+00	7.4900E-01	1.6486E-01	V/VO	20
9.1000E-01	9.1732E-01	9.1202E-01	1.3514E+00	7.4000E-01	1.7361E-01	V/VO	20
1.0900E+00	1.0783E+00	1.0730E+00	1.3831E+00	7.2300E-01	1.9612E-01	V/VO	20
1.1000E+00	1.1094E+00	1.1041E+00	1.3889E+00	7.2000E-01	1.9808E-01	V/VO	20
1.3500E+00	1.3538E+00	1.3485E+00	1.4306E+00	6.9900E-01	2.2752E-01	V/VO	20

1.5000E+00	1.5165E+00	1.5112E+00	1.4556E+00	6.8700E-01	2.4456E-01	V/VO	20
1.5200E+00	1.4881E+00	1.4828E+00	1.4514E+00	6.8900E-01	2.4540E-01	V/VO	20
1.6500E+00	1.6668E+00	1.6615E+00	1.4771E+00	6.7700E-01	2.6056E-01	V/VO	20
1.7600E+00	1.7476E+00	1.7923E+00	1.4948E+00	6.6900E-01	2.7242E-01	V/VO	20
1.7800E+00	1.7474E+00	1.7421E+00	1.4881E+00	6.7200E-01	2.7272E-01	V/VO	20
1.8400E+00	1.9386E+00	1.9333E+00	1.5129E+00	6.6100E-01	2.8189E-01	V/VO	20
1.9200E+00	1.9570E+00	1.9517E+00	1.5152E+00	6.6000E-01	2.8837E-01	V/VO	20
2.1100E+00	2.0907E+00	2.0854E+00	1.5314E+00	6.5300E-01	3.0540E-01	V/VO	20
2.1900E+00	2.1306E+00	2.1253E+00	1.5361E+00	6.5100E-01	3.1203E-01	V/VO	20
2.2400E+00	2.2336E+00	2.2283E+00	1.5480E+00	6.4600E-01	3.1783E-01	V/VO	20
2.2800E+00	2.1508E+00	2.1455E+00	1.5385E+00	6.5000E-01	3.1884E-01	V/VO	20
2.4300E+00	2.4318E+00	2.4265E+00	1.5699E+00	6.3700E-01	3.3521E-01	V/VO	20
2.4500E+00	2.4089E+00	2.4036E+00	1.5574E+00	6.3800E-01	3.3613E-01	V/VO	20
2.6800E+00	2.7759E+00	2.7706E+00	1.6051E+00	6.2300E-01	3.5876E-01	V/VO	20

* IMPLIES LINFAW TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.84631E-02(MB)


IRON
3.000
2.700
2.400
2.100
1.800
1.500
1.200
.900
.600
.300
PRESSURE (MB)
.070
.140
.210
.280
.350
.420
.490
.560
.630
.700
MU

CUBIC FIT TO EQUATION OF STATE FOR LEAD

RHO(0)= 11.35500

SUBLIMATION ENERGY= 9.15500E+09

GRUNEISEN COEF= 2.2000

AMU= 5.56395E-02(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 2.160E-01(CM/MICROSEC)

CS= 7.000E-02(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 2.900E-05

SPECIFIC HEAT(CP)= 2.675E+07

CB= 2.100E-01(CM/MICROSEC)

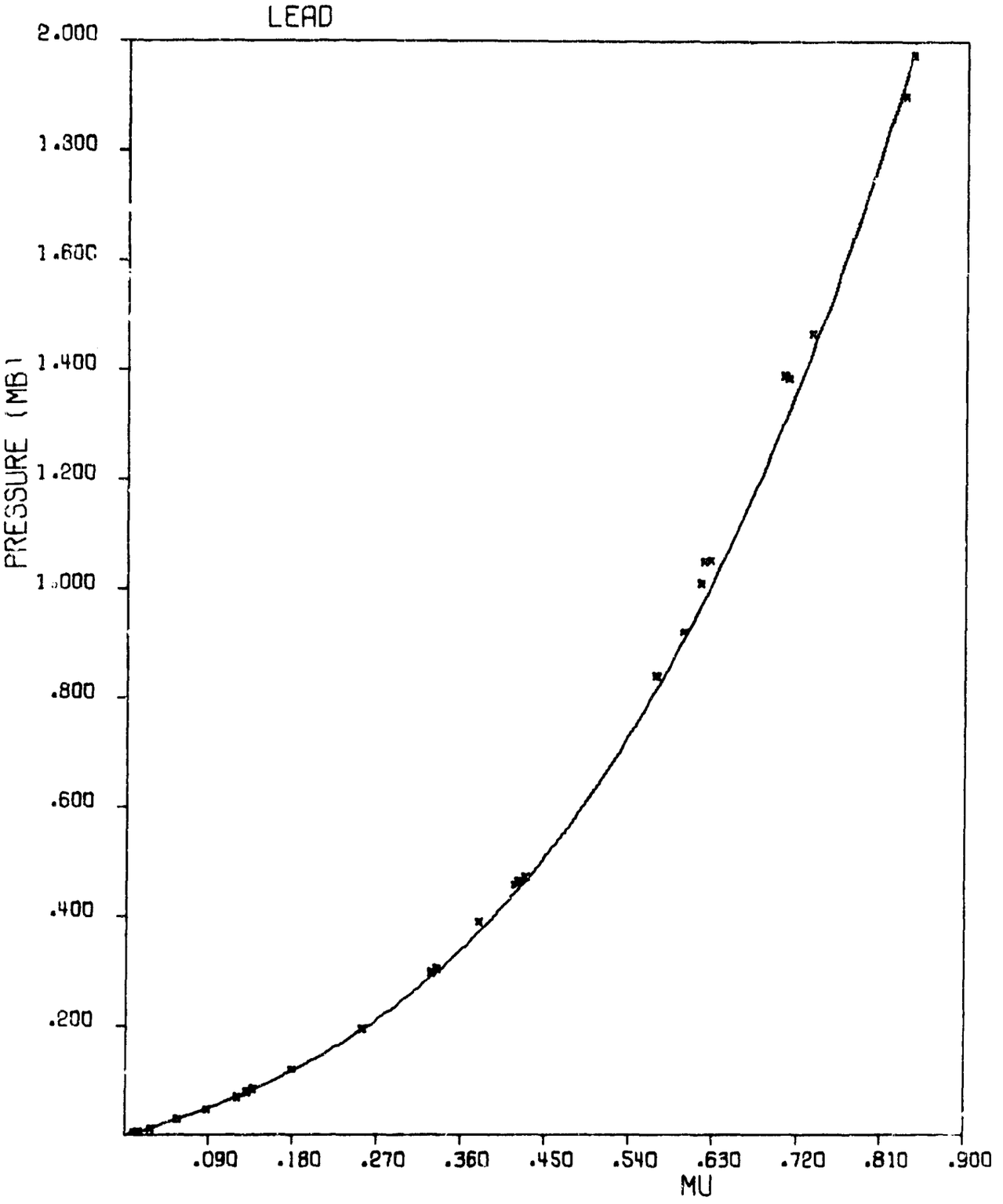
SLOPE OF US-UP= 1.4500

IN THE FIRST PLASTIC WAVE C1= .50076 * D1= .49865 S1= 2.01909

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
4.2000E-03	5.0589E-03	5.0589E-03	1.0100E+00	9.9010E-01	1.9136E-03	V/VO	24
8.2800E-03	7.5886E-03	7.5886E-03	1.0149E+00	9.8530E-01	2.8513E-03	V/VO	24
1.1820E-02	1.3985E-02	1.3985E-02	1.0271E+00	9.7360E-01	5.2422E-03	V/VO	24
2.7950E-02	3.0198E-02	3.0198E-02	1.0564E+00	9.4660E-01	1.1465E-02	V/VO	24
4.7240E-02	4.9317E-02	4.9317E-02	1.0880E+00	9.1910E-01	1.8346E-02	V/VO	24
6.8550E-02	7.0989E-02	7.0989E-02	1.1203E+00	8.9260E-01	2.5463E-02	V/VO	24
7.8120E-02	7.8670E-02	7.8670E-02	1.1310E+00	8.8420E-01	2.8226E-02	V/VO	24
8.3000E-02	8.3648E-02	8.3648E-02	1.1377E+00	8.7900E-01	2.9740E-02	V/VO	4
1.2000E-01	1.1741E-01	1.1741E-01	1.1792E+00	8.4800E-01	4.0079E-02	V/VO	4
1.9480E-01	1.9236E-01	1.9236E-01	1.2539E+00	7.9750E-01	5.8940E-02	V/VO	13
1.9500E-01	1.9326E-01	1.9326E-01	1.2547E+00	7.9700E-01	5.9043E-02	V/VO	4
2.9530E-01	2.8865E-01	2.8865E-01	1.3277E+00	7.5320E-01	8.0114E-02	V/VO	13
3.0320E-01	2.9872E-01	2.9872E-01	1.3344E+00	7.4940E-01	8.1802E-02	V/VO	13
3.9000E-01	3.7187E-01	3.7187E-01	1.3793E+00	7.2500E-01	9.7186E-02	V/VO	15
4.5700E-01	4.4477E-01	4.4477E-01	1.4184E+00	7.0500E-01	1.0896E-01	V/VO	4
4.6480E-01	4.4797E-01	4.4797E-01	1.4201E+00	7.0420E-01	1.0994E-01	V/VO	8
4.7170E-01	4.6597E-01	4.6597E-01	1.4290E+00	6.9980E-01	1.1167E-01	V/VO	13
8.3800E-01	8.1349E-01	8.1349E-01	1.5674E+00	6.3800E-01	1.6345E-01	V/VO	5
9.2000E-01	9.0773E-01	9.0773E-01	1.5974E+00	6.2600E-01	1.7407E-01	V/VO	4
1.0080E+00	9.6974E-01	9.6974E-01	1.6160E+00	6.1880E-01	1.8396E-01	V/VO	8
1.0490E+00	9.7690E-01	9.7690E-01	1.6181E+00	6.1800E-01	1.8786E-01	V/VO	8
1.0520E+00	1.0042E+00	1.0042E+00	1.6260E+00	6.1500E-01	1.8886E-01	V/VO	8
1.3830E+00	1.3270E+00	1.3270E+00	1.7094E+00	5.8500E-01	2.2482E-01	V/VO	8
1.3880E+00	1.3024E+00	1.3024E+00	1.7036E+00	5.8700E-01	2.2469E-01	V/VO	8
1.4670E+00	1.4347E+00	1.4347E+00	1.7340E+00	5.7670E-01	2.3385E-01	V/VO	8
1.9000E+00	1.9349E+00	1.9349E+00	1.8339E+00	5.4530E-01	2.7583E-01	V/VO	8
1.9730E+00	1.9802E+00	1.9802E+00	1.8420E+00	5.4290E-01	2.8182E-01	V/VO	8

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.82703E-02(MB)


LEAD
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.090
.180
.270
.360
.450
.540
.630
.720
.810
.900
MU

CUBIC FIT TO EQUATION OF STATE FOR LUCITE

RHO(0)= 1.18100

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF=-0. *NO DATA

AMU= 2.24910E-02(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 2.690E-01(CM/MICROSEC)

CS= 1.380E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 2.188E-01(CM/MICROSEC)

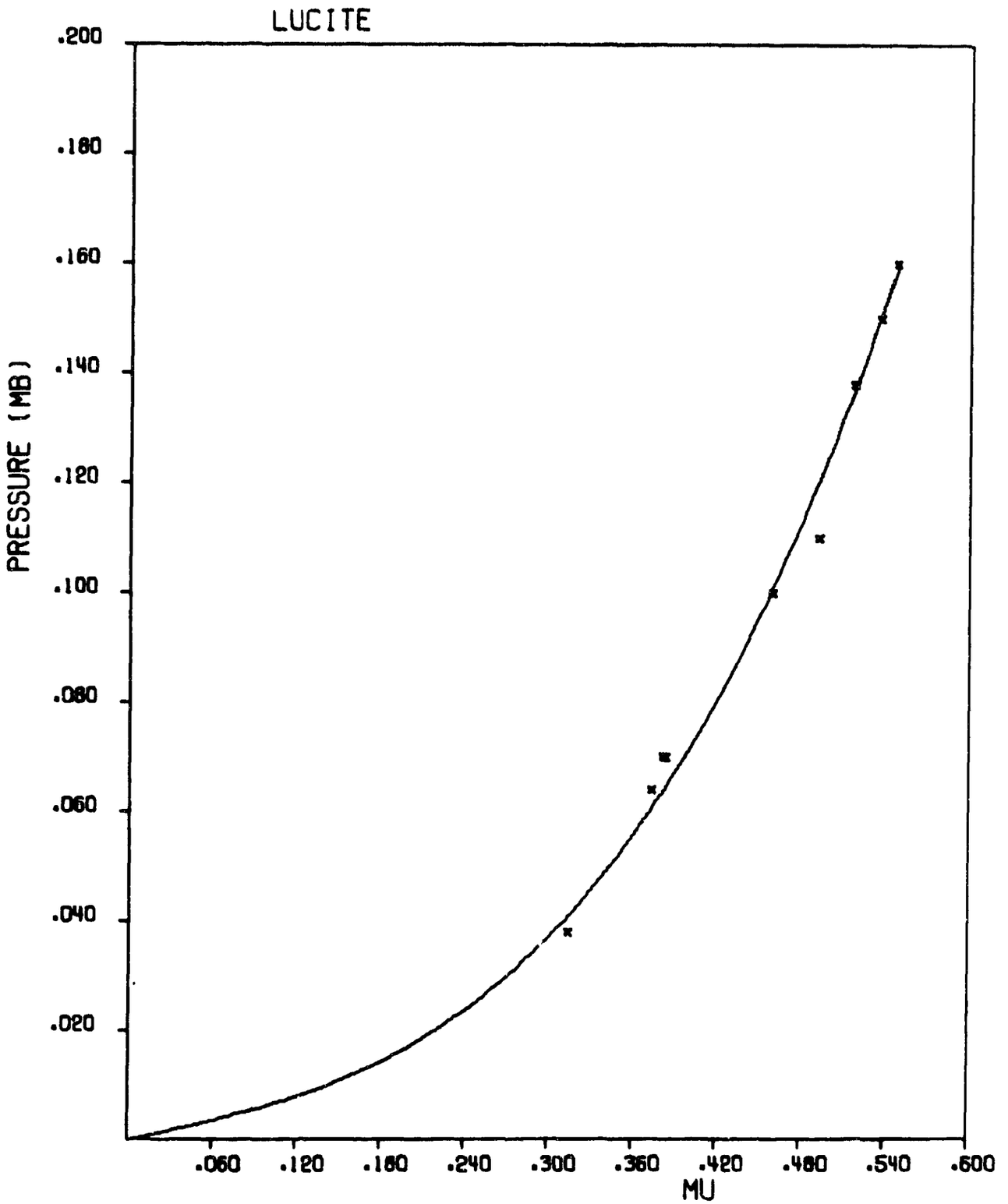
SLOPE OF US-UP= 1.8302

IN THE FIRST PLASTIC WAVE C1= .85654 * D1= -.02314 S1= .82308

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.6000E-01	1.5948E-01	1.5948E-01	1.5400E+00	6.4600E-01	2.1900E-01	V/VO	20
1.5000E-01	1.5048E-01	1.5048E-01	1.5361E+00	6.5169E-01	2.1054E-01	V/VO	20
1.0000E-01	1.0114E-01	1.0114E-01	1.4599E+00	6.8500E-01	1.6332E-01	V/VO	28
7.0000E-02	6.4552E-02	6.4552E-02	1.3831E+00	7.2300E-01	1.2813E-01	V/VO	20
7.0000E-02	6.3789E-02	6.3789E-02	1.3812E+00	7.2400E-01	1.2790E-01	V/VO	20
1.1000E-01	1.2058E-01	1.2058E-01	1.4925E+00	6.7000E-01	1.7532E-01	V/VO	4
1.3800E-01	1.3710E-01	1.3710E-01	1.5175E+00	6.5900E-01	1.9961E-01	V/VO	4
6.4000E-02	6.0823E-02	6.0823E-02	1.3736E+00	7.2809E-01	1.2141E-01	V/VO	4
3.8000E-02	4.0971E-02	4.0971E-02	1.3141E+00	7.6100E-01	8.7693E-02	V/VO	4

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 3.49262E-03(MB)


LUCITE
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
PRESSURE (MB)
.060
.120
.180
.240
.300
.360
.420
.480
.540
.600
MU

CUBIC FIT TO EQUATION OF STATE FOR MAGNESIUM

RHO(0)= 1.74500

SUBLIMATION ENERGY= 5.87300E+10

GRUNEISEN COEF= 1.1400

AMU= 1.73148E-01(MB)

YO = 1.10300E-03(MB)

YMU= 3.18514E-03

HUGONIOT ELASTIC LIMIT = 1.88347E-03(MB)

CL= 5.740E-01(CM/MICROSEC)

CS= 3.150E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 7.824E-05

SPECIFIC HEAT(CP)= 1.030E+07

CB= 4.545E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.2423

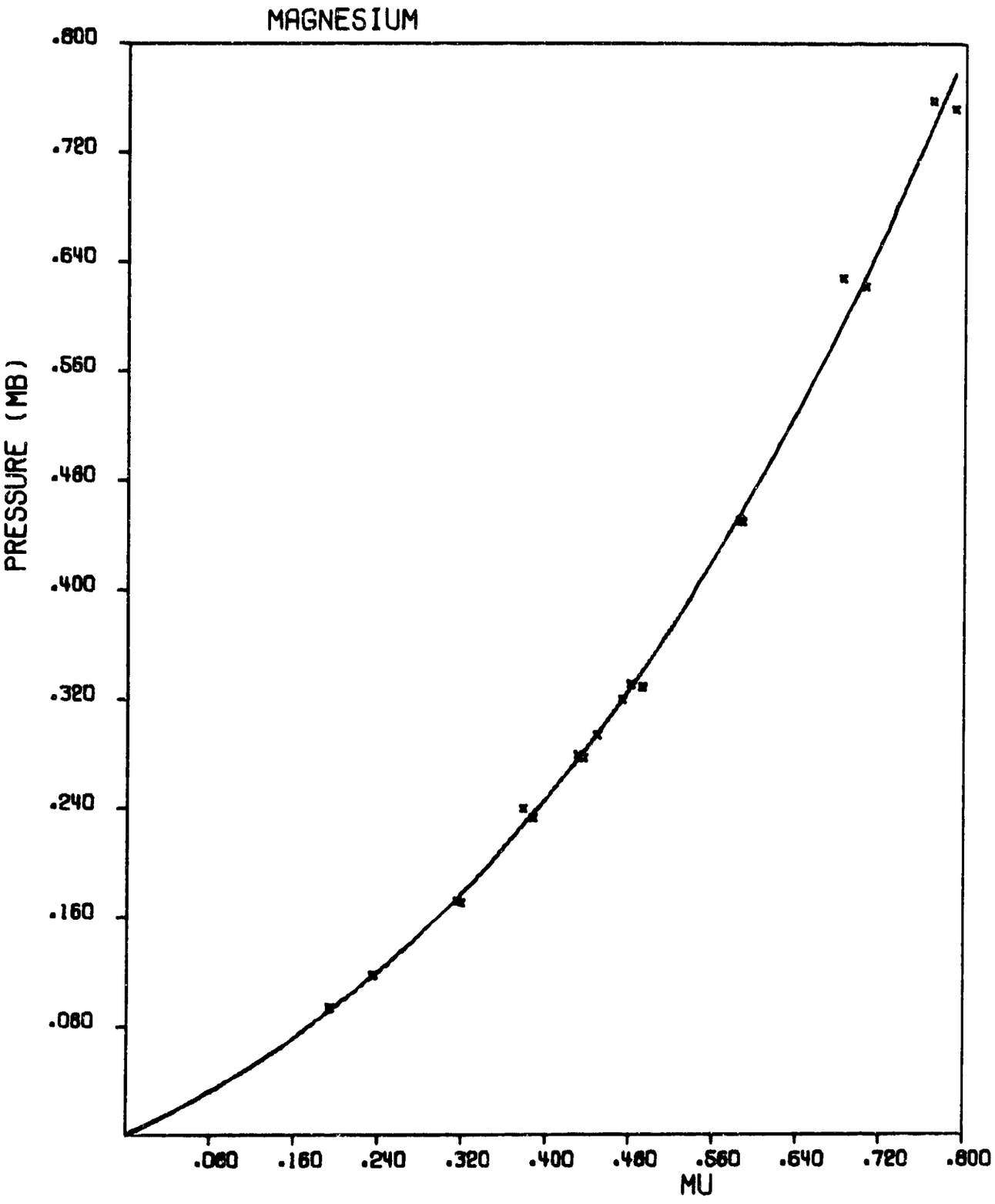
IN THE ELASTIC WAVE C0= .59133

IN THE FIRST PLASTIC WAVE C1= .36047 * D1= .49508 S1= .37320

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
9.3400E-02	9.2381E-02	9.1645E-02	1.1946E+00	8.3710E-01	9.3376E-02	V/VO	17
9.3600E-02	9.1956E-02	9.1221E-02	1.1939E+00	8.3760E-01	9.3333E-02	V/VO	17
1.1770E-01	1.1795E-01	1.1721E-01	1.2355E+00	8.0940E-01	1.1338E-01	V/VO	17
1.1780E-01	1.1745E-01	1.1671E-01	1.2347E+00	8.0990E-01	1.1328E-01	V/VO	17
1.7070E-01	1.7815E-01	1.7741E-01	1.3189E+00	7.5820E-01	1.5380E-01	V/VO	17
1.7160E-01	1.7488E-01	1.7414E-01	1.3148E+00	7.6060E-01	1.5343E-01	V/VO	17
2.4000E-01	2.2804E-01	2.2730E-01	1.3782E+00	7.2560E-01	1.9427E-01	V/VO	17
2.3500E-01	2.3666E-01	2.3595E-01	1.3877E+00	7.2060E-01	1.9315E-01	V/VO	17
2.7700E-01	2.8290E-01	2.8216E-01	1.4360E+00	6.9640E-01	2.1953E-01	V/VO	17
2.7820E-01	2.7736E-01	2.7662E-01	1.4304E+00	6.9910E-01	2.1902E-01	V/VO	17
2.9380E-01	2.9559E-01	2.9486E-01	1.4484E+00	6.9040E-01	2.2831E-01	V/VO	17
3.1970E-01	3.2053E-01	3.1979E-01	1.4721E+00	6.7930E-01	2.4239E-01	V/VO	17
3.2810E-01	3.4123E-01	3.4050E-01	1.4910E+00	6.7070E-01	2.4883E-01	V/VO	17
3.3030E-01	3.3000E-01	3.2926E-01	1.4808E+00	6.7530E-01	2.4791E-01	V/VO	17
4.4940E-01	4.5914E-01	4.5840E-01	1.5876E+00	6.2990E-01	3.0873E-01	V/VO	17
4.5010E-01	4.5447E-01	4.5374E-01	1.5840E+00	6.3130E-01	3.0839E-01	V/VO	17
6.2170E-01	6.3222E-01	6.3148E-01	1.7053E+00	5.8640E-01	3.9387E-01	V/VO	17
6.2770E-01	5.9713E-01	5.9639E-01	1.6832E+00	5.9410E-01	3.8211E-01	V/VO	17
7.5190E-01	7.7766E-01	7.7692E-01	1.7895E+00	5.5880E-01	4.3601E-01	V/VO	17
7.5730E-01	7.4093E-01	7.4019E-01	1.7693E+00	5.6520E-01	4.3439E-01	V/VO	17

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 7.48775E-03(MB)


MAGNESIUM
PRESSURE (MB)
.800
.720
.640
.560
.480
.400
.320
.240
.160
.080
.080
.160
.240
.320
.400
.480
.560
.640
.720
.800
MU

CUBIC FIT TO EQUATION OF STATE FOR MANGANIN

RHO(0)= 8.46000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF= 1.9984

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 5.610E-05

SPECIFIC HEAT(CP)= 4.060E+06

CB= 3.803E-01(CM/MICROSEC)

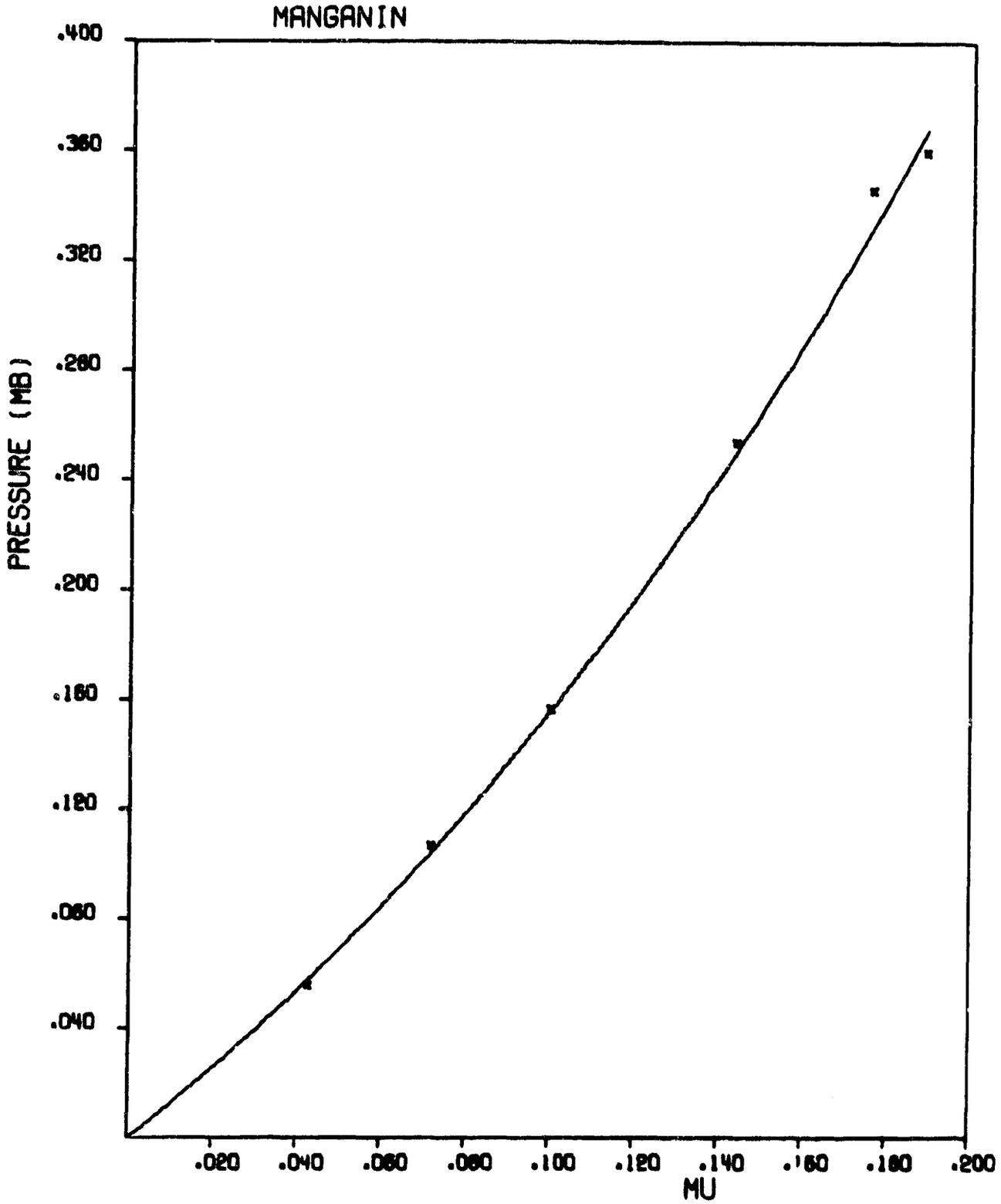
SLOPE OF US-UP= 1.7199

IN THE FIRST PLASTIC WAVE C1= 1.22355 * D1= 2.89370 S1= 4.97993

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
5.6000E-02	5.7910E-02	5.7910E-02	1.0427E+00	9.5905E-01	1.6464E-02	ETA	22
1.0700E-01	1.0461E-01	1.0461E-01	1.0718E+00	9.3301E-01	2.9108E-02	ETA	22
1.5700E-01	1.5627E-01	1.5627E-01	1.1000E+00	9.0909E-01	4.1074E-02	ETA	22
2.5400E-01	2.5107E-01	2.5107E-01	1.1440E+00	8.7413E-01	6.1475E-02	ETA	22
3.4600E-01	3.3213E-01	3.3213E-01	1.1760E+00	8.5034E-01	7.8236E-02	ETA	22
3.6000E-01	3.6824E-01	3.6824E-01	1.1890E+00	8.4104E-01	8.2264E-02	ETA	22

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 5.01129E-03(MB)


MANGANIN
PRESSURE (MB)
.400
.360
.320
.280
.240
.200
.160
.120
.080
.040
.020
.040
.060
.080
.100
.120
.140
.160
.180
.200
MU

CUBIC FIT TO EQUATION OF STATE FOR MOLYBDENUM

RHO(0)= 10.20000

SUBLIMATION ENERGY= 6.80700E+10

GRUNEISEN COEF= 1.4100

AMU= 0. (MB) *NO DATA

Y0 =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 1.490E-05

SPECIFIC HEAT(CP)= 2.384E+06

CB= 5.163E-01(CM/MICROSEC)

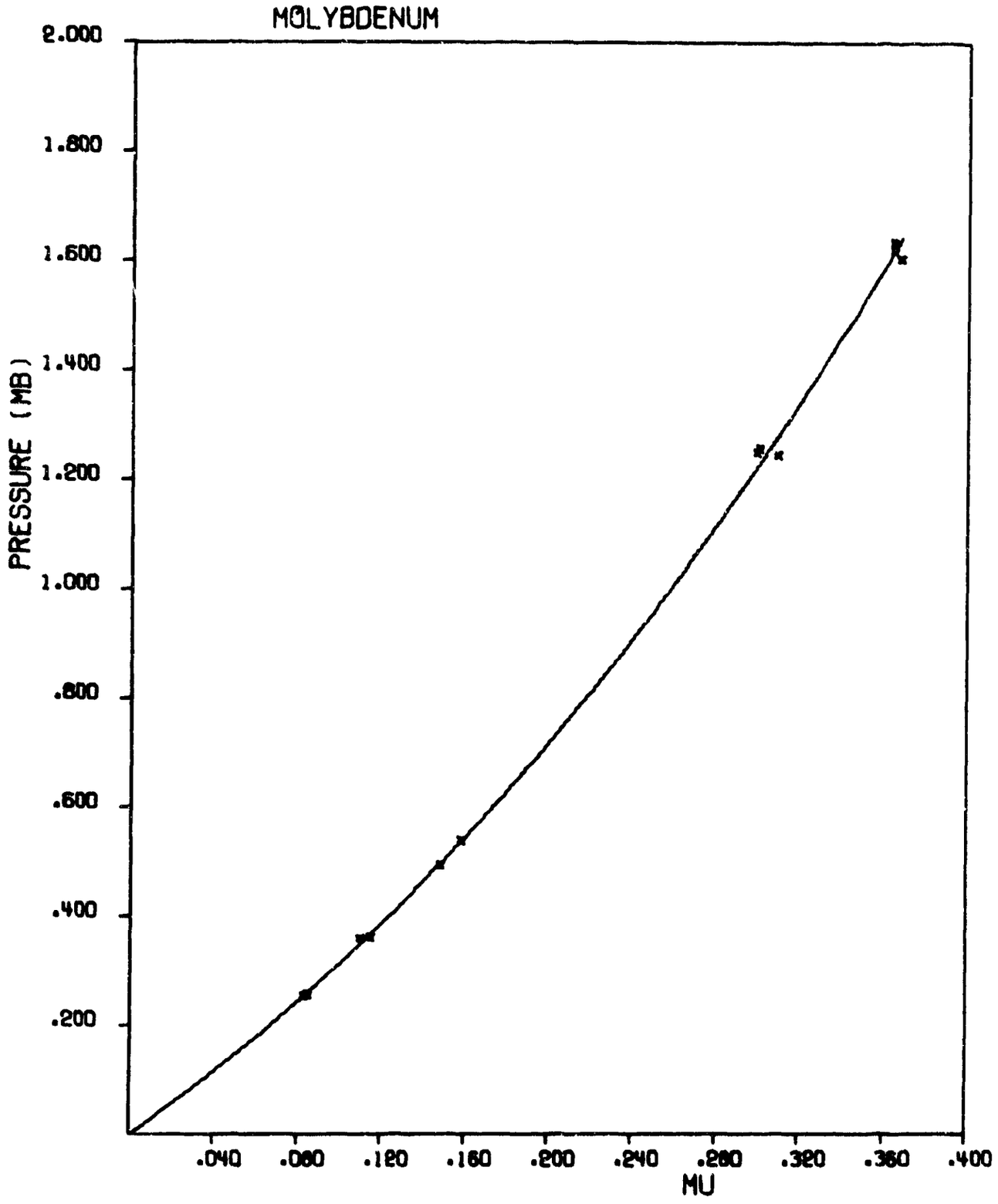
SLOPE OF US-UP= 1.2364

IN THE FIRST PLASTIC WAVE C1= 2.71897 * D1= 3.95760 S1= 2.11146

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/V0	U(CM/MICROSEC)	INPUT	REFERENCE
2.5400E-01	2.5439E-01	2.5439E-01	1.0831E+00	9.2330E-01	4.3703E-02	V/V0	19
2.5520E-01	2.6205E-01	2.6205E-01	1.0853E+00	9.2140E-01	4.4346E-02	V/V0	19
3.5900E-01	3.5024E-01	3.5024E-01	1.1101E+00	9.0080E-01	5.9088E-02	V/V0	19
3.6230E-01	3.6944E-01	3.6944E-01	1.1153E+00	8.9660E-01	6.0603E-02	V/V0	19
5.3840E-01	5.3926E-01	5.3926E-01	1.1586E+00	8.6310E-01	8.5007E-02	V/V0	19
4.9470E-01	4.9796E-01	4.9796E-01	1.1485E+00	8.7070E-01	7.9190E-02	V/V0	19
1.2560E+00	1.2311E+00	1.2311E+00	1.3004E+00	7.6900E-01	1.6866E-01	V/V0	19
1.2450E+00	1.2798E+00	1.2798E+00	1.3089E+00	7.6400E-01	1.6972E-01	V/V0	19
1.2500E+00	1.2215E+00	1.2215E+00	1.2987E+00	7.7000E-01	1.6789E-01	V/V0	19
1.6040E+00	1.6417E+00	1.6417E+00	1.3680E+00	7.3100E-01	2.0567E-01	V/V0	19
1.6180E+00	1.6176E+00	1.6176E+00	1.3643E+00	7.3300E-01	2.0580E-01	V/V0	19
1.6330E+00	1.6176E+00	1.6176E+00	1.3643E+00	7.3300E-01	2.0675E-01	V/V0	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.40804E-02(MB)


MOLYBDENUM
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.040
.080
.120
.160
.200
.240
.280
.320
.360
.400
MU

CUBIC FIT TO EQUATION OF STATE FOR MYLAR

RHO(0)= 1.39000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF=-0. *NO DATA

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 2.200E-01(CM/MICROSEC)

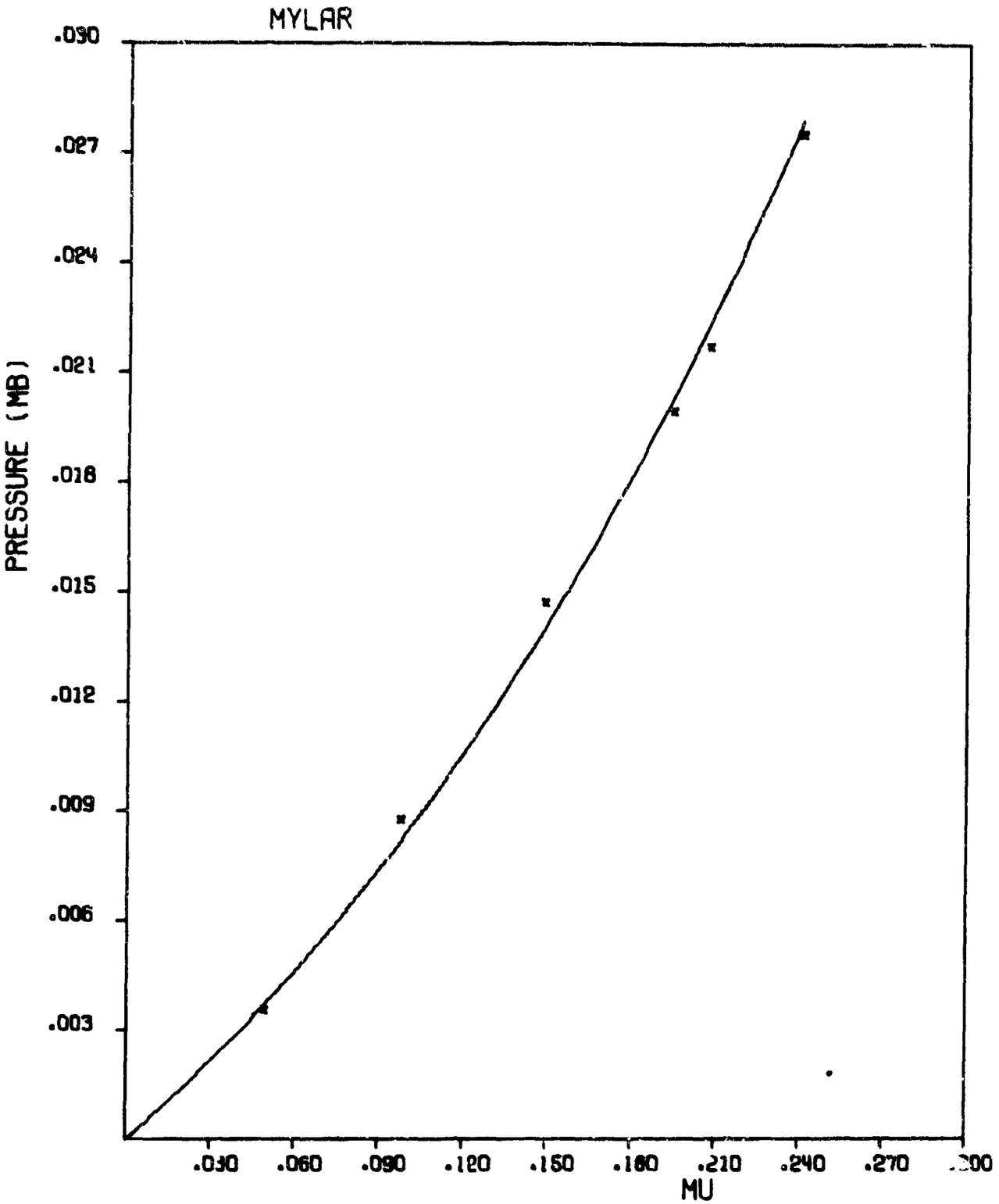
SLOPE OF US-UP= 1.6313

IN THE FIRST PLASTIC WAVE C1= .06728 * D1= .14549 S1= .23627

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
3.5500E-03	3.7001E-03	3.7001E-03	1.0493E+00	9.5300E-01	1.0956E-02	V/VO	42
8.7400E-03	8.1814E-03	8.1814E-03	1.0977E+00	9.1100E-01	2.3656E-02	V/VO	42
1.4710E-02	1.4090E-02	1.4090E-02	1.1494E+00	8.7000E-01	3.7091E-02	V/VO	42
1.9950E-02	2.0364E-02	2.0364E-02	1.1947E+00	8.3700E-01	4.8368E-02	V/VO	42
2.1700E-02	2.2371E-02	2.2371E-02	1.2077E+00	8.2800E-01	5.1819E-02	V/VO	42
2.7500E-02	2.7916E-02	2.7916E-02	1.2407E+00	8.0600E-01	6.1953E-02	V/VO	42

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 4.71865E-04(MB)


MYLAR
.090
.027
.024
.021
.018
.015
.012
.009
.006
.003
PRESSURE (MB)
.030
.060
.090
.120
.150
.180
.210
.240
.270
MU

CUBIC FIT TO EQUATION OF STATE FOR NICKEL

RHO(0)= 8.86000

SUBLIMATION ENERGY= 7.10400E+10

GRUNEISEN COEF= 2.0000

AMU= 7.76278E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 5.630E-01(CM/MICROSEC)

CS= 2.960E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 3.810E-05

SPECIFIC HEAT(CP)= 2.608E+06

CB= 4.652E-01(CM/MICROSEC)

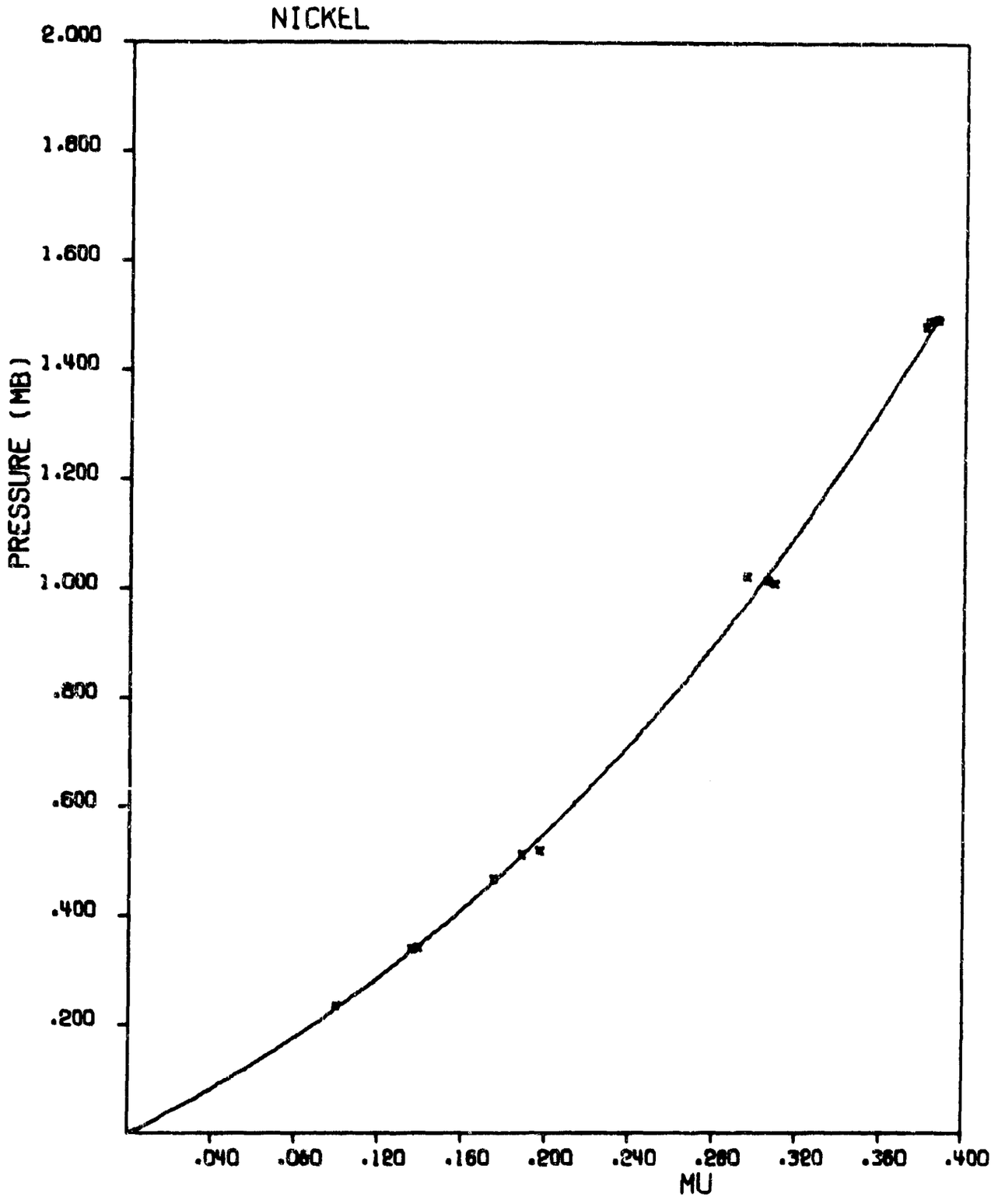
SLOPE OF US-UP= 1.4453

IN THE FIRST PLASTIC WAVE C1= 1.91740 * D1= 3.41861 S1= 4.26322

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.3500E-01	2.2884E-01	2.2884E-01	1.0995E+00	9.0950E-01	4.8994E-02	V/VO	19
3.3940E-01	3.3544E-01	3.3544E-01	1.1362E+00	8.8010E-01	6.7772E-02	V/VO	19
3.4180E-01	3.4468E-01	3.4468E-01	1.1392E+00	8.7780E-01	6.8660E-02	V/VO	19
5.1100E-01	5.1196E-01	5.1196E-01	1.1886E+00	8.4130E-01	9.5671E-02	V/VO	19
5.1900E-01	5.4257E-01	5.4257E-01	1.1969E+00	8.3550E-01	9.8163E-02	V/VO	19
4.6700E-01	4.6340E-01	4.6340E-01	1.1751E+00	8.5100E-01	8.8621E-02	V/VO	19
1.0090E+00	1.0441E+00	1.0441E+00	1.3089E+00	7.6400E-01	1.6394E-01	V/VO	19
1.0140E+00	1.0263E+00	1.0263E+00	1.3055E+00	7.6600E-01	1.6365E-01	V/VO	19
1.0220E+00	9.7429E-01	9.7429E-01	1.2953E+00	7.7200E-01	1.6217E-01	V/VO	19
1.4780E+00	1.4639E+00	1.4639E+00	1.3812E+00	7.2400E-01	2.1457E-01	V/VO	19
1.4910E+00	1.5009E+00	1.5009E+00	1.3870E+00	7.2100E-01	2.1668E-01	V/VO	19
1.4900E+00	1.4762E+00	1.4762E+00	1.3831E+00	7.2300E-01	2.1583E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.45063E-02(MB)


NICKEL
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.040
.080
.120
.160
.200
.240
.280
.320
.360
.400
MU

CUBIC FIT TO EQUATION OF STATE FOR NIOBIUM

RHO(0)= 8.58000

SUBLIMATION ENERGY= 7.90900E+10

GRUNEISEN COEF= 1.6564

AMU= 3.81990E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 5.030E-01(CM/MICROSEC)

CS= 2.110E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 2.100E-05

SPECIFIC HEAT(CP)= 2.497E+06

CB= 4.438E-01(CM/MICROSEC)

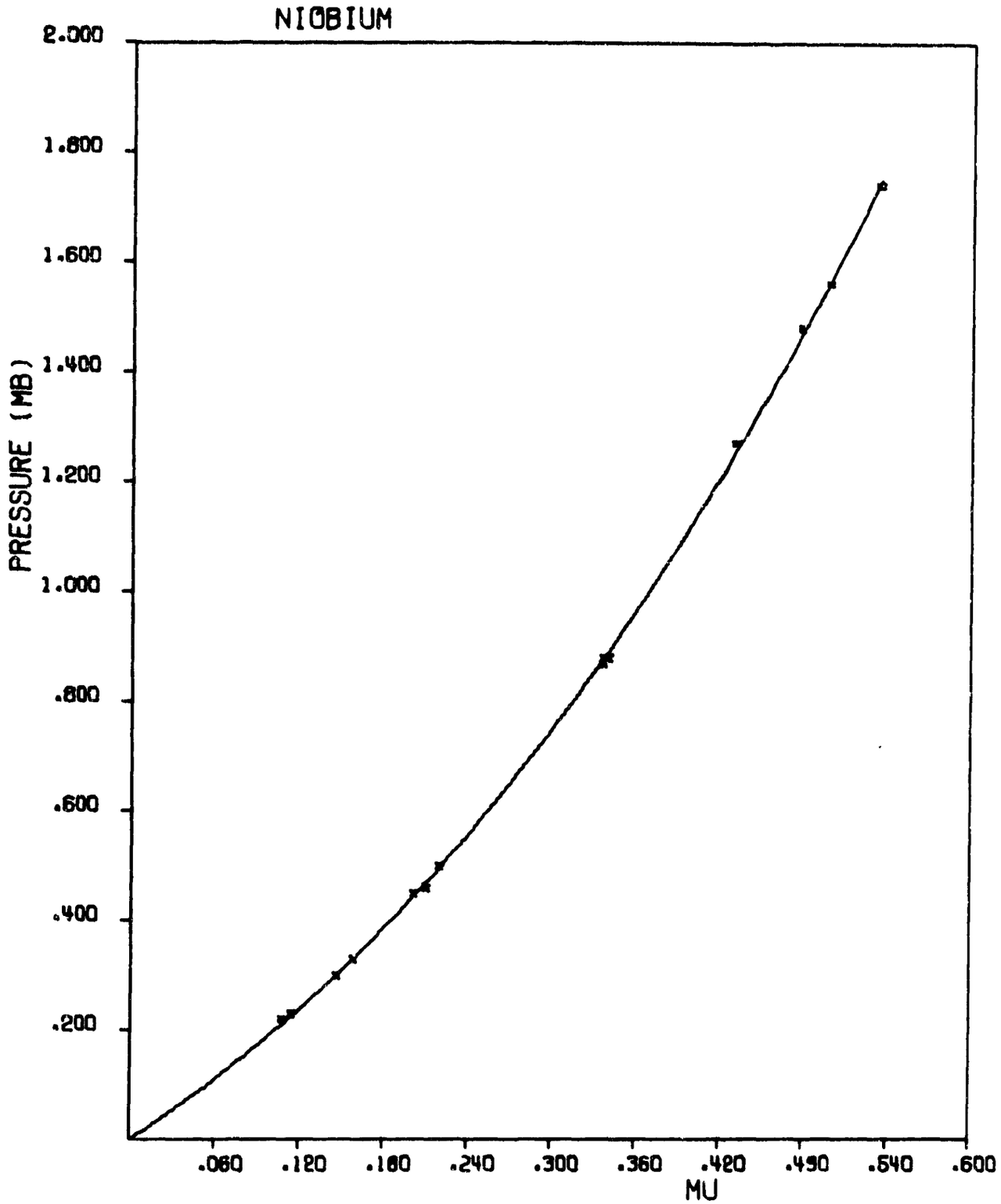
SLOPE OF US-UP= 1.2082

IN THE FIRST PLASTIC WAVE C1= 1.68990 * D1= 2.34551 S1= 1.18151

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.2000E-01	2.1006E-01	2.1006E-01	1.1074E+00	9.0300E-01	4.9872E-02	V/VO	20
2.3000E-01	2.2676E-01	2.2676E-01	1.1148E+00	8.9700E-01	5.2540E-02	V/VO	20
3.0000E-01	3.0233E-01	3.0233E-01	1.1468E+00	8.7200E-01	6.6099E-02	V/VO	20
3.3000E-01	3.3211E-01	3.3211E-01	1.1587E+00	8.6300E-01	7.2589E-02	V/VO	20
4.5000E-01	4.4659E-01	4.4659E-01	1.2019E+00	8.3200E-01	9.3868E-02	V/VO	20
4.6000E-01	4.7111E-01	4.7111E-01	1.2107E+00	8.2600E-01	9.6585E-02	V/VO	20
5.0000E-01	4.9647E-01	4.9647E-01	1.2195E+00	8.2000E-01	1.0242E-01	V/VO	20
8.7000E-01	8.8072E-01	8.8072E-01	1.3369E+00	7.4800E-01	1.5985E-01	V/VO	20
8.8000E-01	8.9393E-01	8.9393E-01	1.3405E+00	7.4600E-01	1.6140E-01	V/VO	20
8.8000E-01	8.8072E-01	8.8072E-01	1.3369E+00	7.4800E-01	1.6077E-01	V/VO	20
1.2700E+00	1.2570E+00	1.2570E+00	1.4306E+00	6.9908E-01	2.1108E-01	V/VO	20
1.4800E+00	1.4685E+00	1.4685E+00	1.4771E+00	6.7700E-01	2.3604E-01	V/VO	20
1.5600E+00	1.5643E+00	1.5643E+00	1.4970E+00	6.6800E-01	2.4569E-01	V/VO	20
1.7400E+00	1.7498E+00	1.7498E+00	1.5337E+00	6.5200E-01	2.6566E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 7.12333E-03(MB)


NIOBIUM
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.060
.120
.180
.240
.300
.360
.420
.490
.540
.600
MU

CUBIC FIT TO EQUATION OF STATE FOR NYLON

RHO(0)= 1.14000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF= .9100

AMU= 1.43002E-02(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 2.516E-01(CM/MICROSEC)

CS= 1.120E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 2.700E-04

SPECIFIC HEAT(CP)= 1.520E+07

CB= 2.158E-01(CM/MICROSEC)

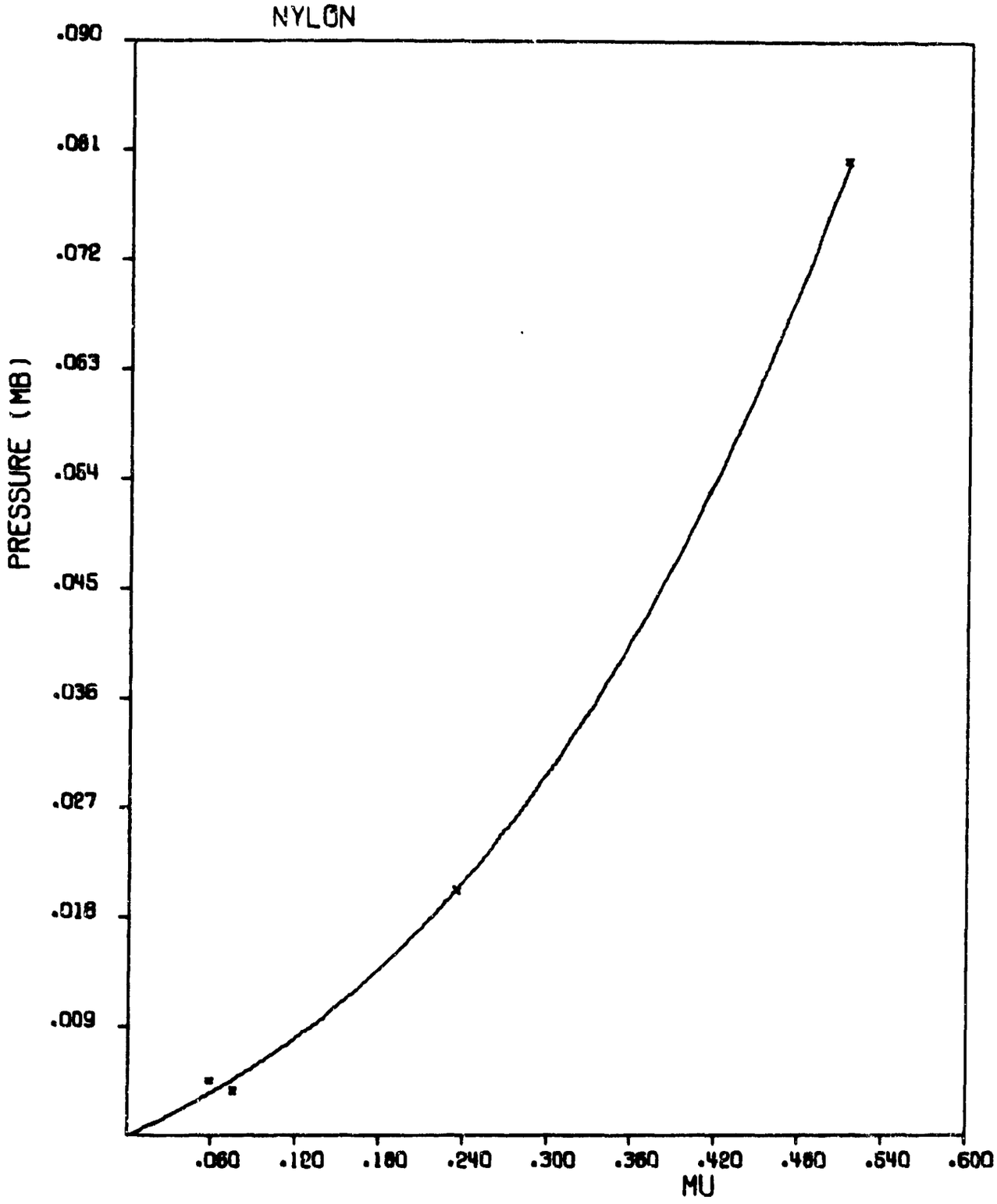
SLOPE OF US-UP= 1.5497

IN THE FIRST PLASTIC WAVE C1= .05309 * D1= .09435 S1= .20632

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
4.5000E-03	3.4501E-03	3.4501E-03	1.0582E+00	9.4500E-01	1.4734E-02	V/VO	19
3.6400E-03	4.6185E-03	4.6185E-03	1.0753E+00	9.3000E-01	1.4950E-02	V/VO	19
2.0200E-02	2.0307E-02	2.0307E-02	1.2346E+00	8.1000E-01	5.8023E-02	V/VO	19
8.0200E-02	7.9876E-02	7.9876E-02	1.5129E+00	6.6100E-01	1.5443E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 6.14969E-04(MB)


NYLON
.090
.081
.072
.063
.054
.045
.036
.027
.018
.009
PRESSURE (MB)
.060
.120
.180
.240
.300
.360
.420
.480
.540
.600
MU

CUBIC FIT TO EQUATION OF STATE FOR PALLADIUM

RHO(0)= 11.95000

SUBLIMATION ENERGY= 3.64000E+10

GRUNEISEN COEF= 2.8400

AMU= 5.07110E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 4.570E-01(CM/MICROSEC)

CS= 2.060E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 3.450E-05

SPECIFIC HEAT(CP)= 2.600E+06

CB= 3.742E-01(CM/MICROSEC)

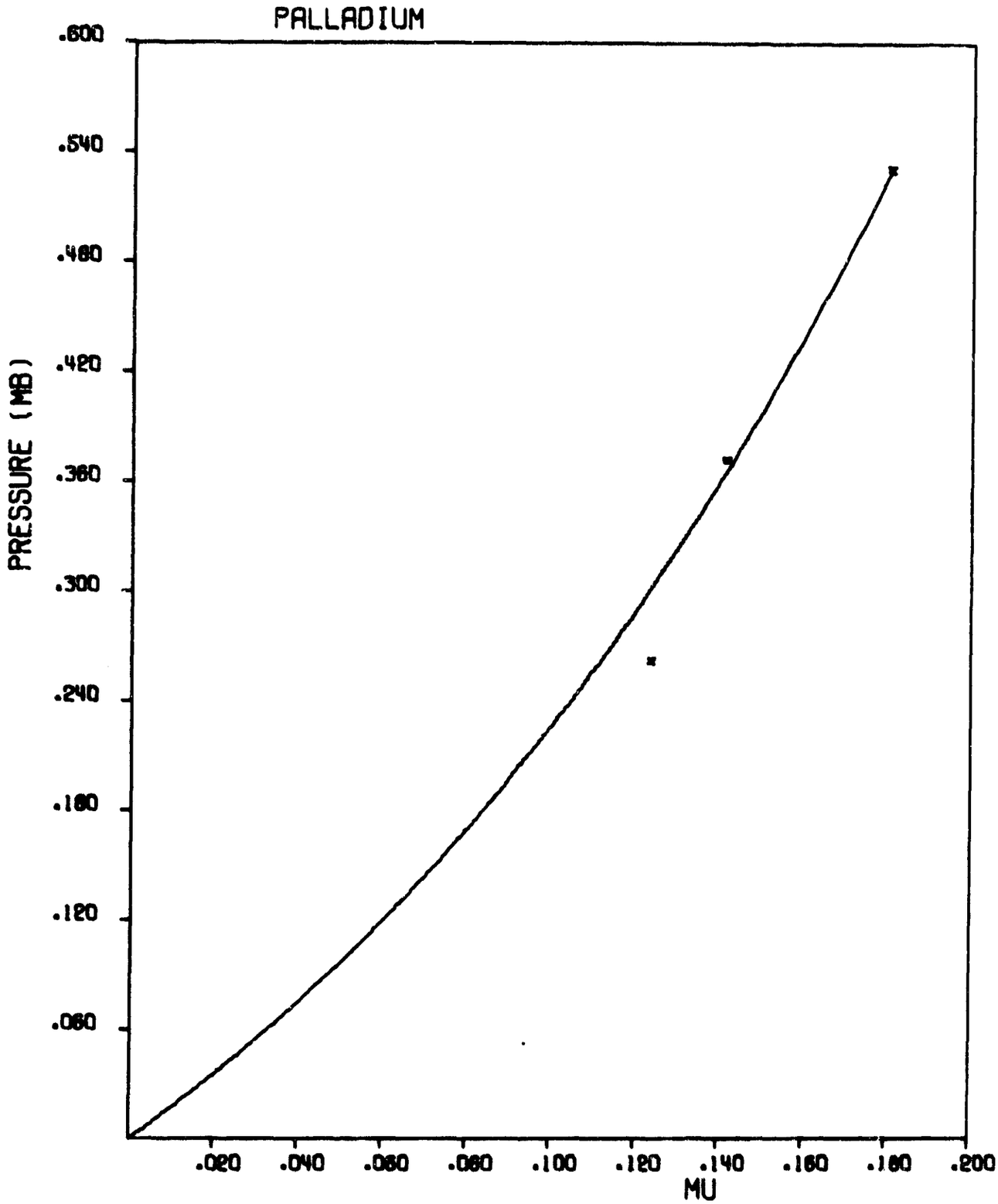
SLOPE OF US-UP= 1.9975

IN THE FIRST PLASTIC WAVE C1= 1.67331 * D1= 4.58725 S1= 13.39948

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.6250E-01	3.0305E-01	3.0305E-01	1.1238E+00	8.8980E-01	4.9201E-02	V/VO	19
3.7200E-01	3.6629E-01	3.6629E-01	1.1414E+00	8.7610E-01	6.2105E-02	V/VO	19
5.3100E-01	5.3028E-01	5.3028E-01	1.1805E+00	8.4710E-01	8.2427E-02	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.56619E-02(MB)


PALLADIUM
.600
.540
.480
.420
.360
.300
.240
.180
.120
.060
PRESSURE (MB)
.020
.040
.060
.080
.100
.120
.140
.160
.180
.200
MU

CUBIC FIT TO EQUATION OF STATE FOR PARAFFIN

RHO(0)= .91

SUPERSONIC C0= -0. *NO DATA CL= -0. (CM/MICROSEC) *NO DATA

GRUNEISEN COEF= 1.1867 CS= -0. (CM/MICROSEC) *NO DATA

A**1= 0. (MB) *NO DATA THERMAL COEF OF EXPANSION(VOL)= 3.900E-04

Y0 =-0. (MB) SPECIFIC HEAT(CP)= 2.900E+07

Y**1= 1. CB= 2.968E-01(CM/MICROSEC)

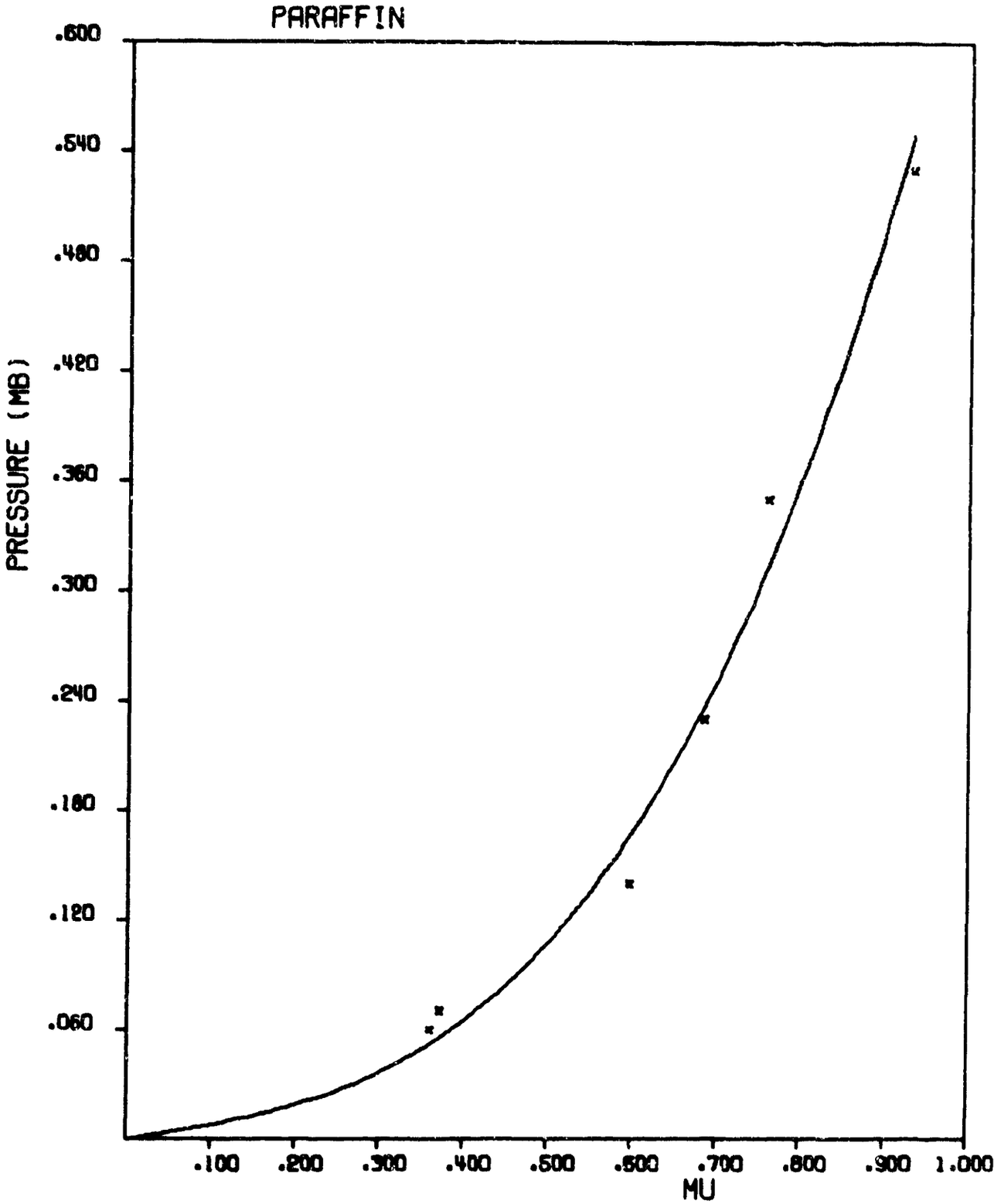
HUGONIOT ELASTIC LIMIT =-0. (MB) SLOPE OF US-UP= 1.5273

IN THE FIRST PLASTIC WAVE C1= .08087 * D1= -.05673 S1= .64874

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
6.0000E-02	5.2187E-02	5.2187E-02	1.3605E+00	7.3500E-01	1.3161E-01	V/VO	20
7.0000E-02	5.5549E-02	5.5549E-02	1.3717E+00	7.2900E-01	1.4375E-01	V/VO	20
1.4000E-01	1.6641E-01	1.6641E-01	1.5974E+00	6.2600E-01	2.3882E-01	V/VO	20
2.3000E-01	2.3852E-01	2.3852E-01	1.6863E+00	5.9300E-01	3.1933E-01	V/VO	20
3.5000E-01	3.1411E-01	3.1411E-01	1.7606E+00	5.6800E-01	4.0584E-01	V/VO	20
5.3000E-01	5.4879E-01	5.4879E-01	1.9305E+00	5.1800E-01	5.2752E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.66678E-02(MB)


PARAFFIN
.600
.540
.480
.420
.360
.300
.240
.180
.120
.060
PRESSURE (MB)
.100
.200
.300
.400
.500
.600
.700
.800
.900
1.000
MU

CUBIC FIT TO EQUATION OF STATE FOR AVCO PHENOLIC FIBERGLASS

RHO(0)= 1.90000

SUBLIMATION ENERGY= 1.75000E+11

GRUNEISEN COEF= .2093

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 6.660E-05

SPECIFIC HEAT(CP)= 9.339E+06

CB= 1.713E-01(CM/MICROSEC)

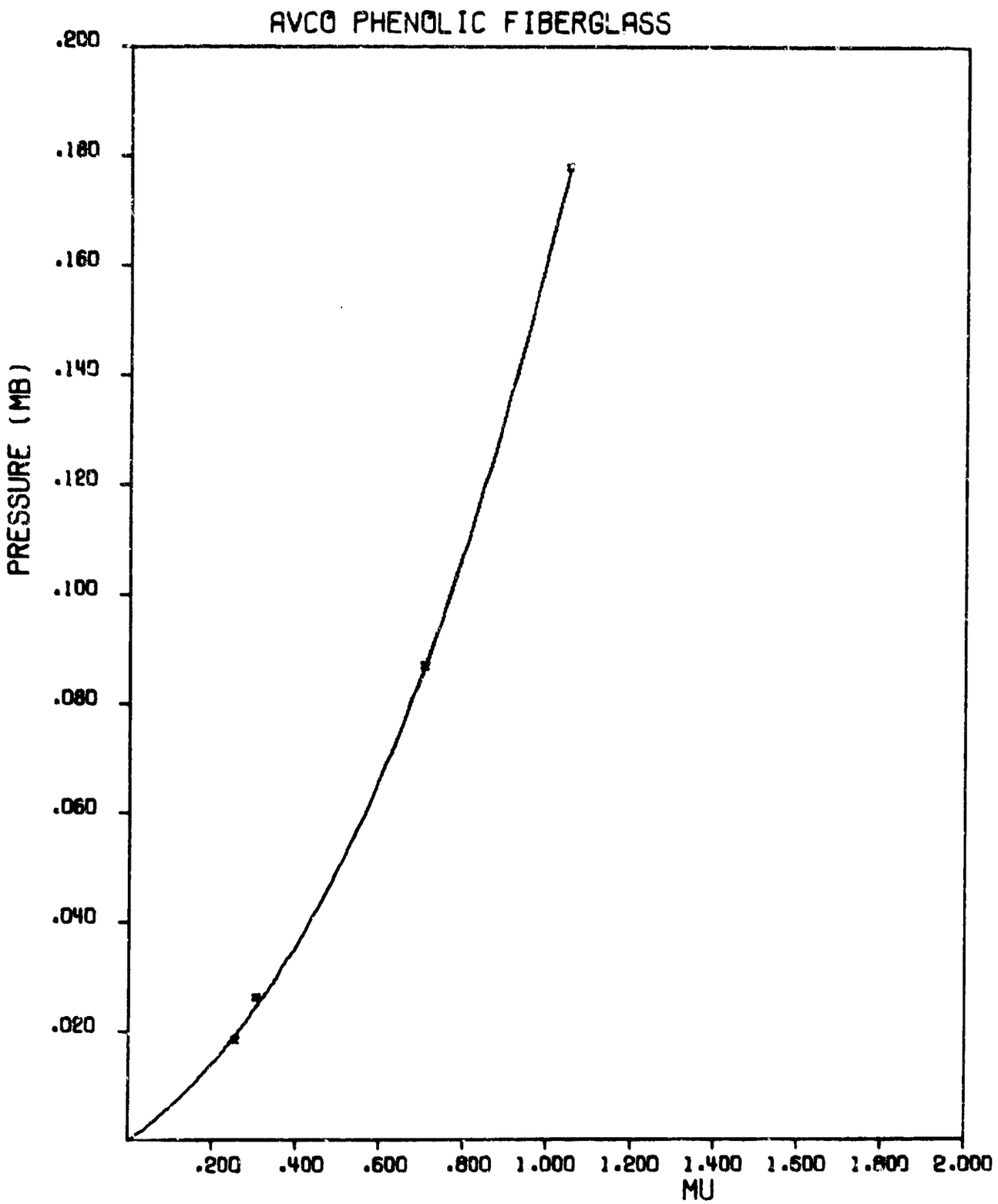
SLOPE OF US-UP= 1.1713

IN THE FIRST PLASTIC WAVE C1= .05575 * D1= .06978 S1= .03701

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.8500E-02	1.9339E-02	1.9339E-02	1.2547E+00	7.9700E-01	4.4459E-02	V/VO	19
2.6200E-02	2.4598E-02	2.4598E-02	1.3055E+00	7.6600E-01	5.6804E-02	V/VO	19
8.6800E-02	8.7267E-02	8.7267E-02	1.7065E+00	5.8600E-01	1.3753E-01	V/VO	19
1.7800E-01	1.7805E-01	1.7805E-01	2.0492E+00	4.8800E-01	2.1901E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 7.38839E-04(MB)


AVCO PHENOLIC FIBERGLASS
PRESSURE (MB)
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
.200
.400
.600
.800
1.000
1.200
1.400
1.600
1.800
2.000
MU

CUBIC FIT TO EQUATION OF STATE FOR G E PHENOLIC FIBERGLASS

RHO(0)= 1.94000

SUBLIMATION ENERGY= 1.78500E+11

GRUNEISEN COEF= .3200

AMU= 1.17905E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 4.340E-01(CM/MICROSEC)

CS= 2.465E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 7.200E-05

SPECIFIC HEAT(CP)= 9.377E+06

CB= 3.276E-01(CM/MICROSEC)

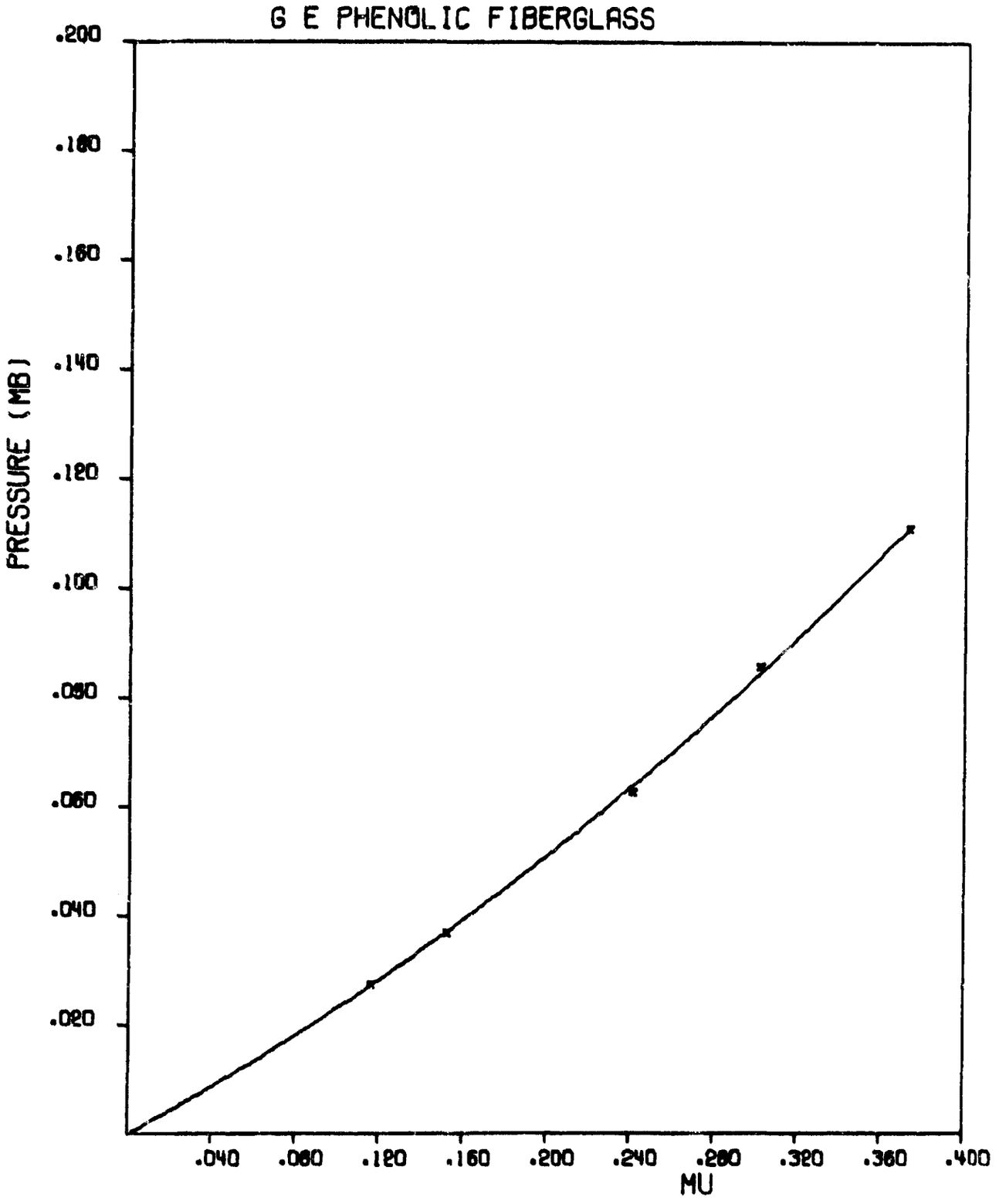
SLOPE OF US-UP= 1.0544

IN THE FIRST PLASTIC WAVE C1= .20820 * D1= .23070 S1= .02566

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.7500E-02	2.7315E-02	2.7315E-02	1.1161E+00	8.9600E-01	3.8336E-02	V/VO	19
3.6900E-02	3.7088E-02	3.7088E-02	1.1521E+00	8.6800E-01	5.0107E-02	V/VO	19
6.2700E-02	6.3837E-02	6.3837E-02	1.2407E+00	8.0600E-01	7.9183E-02	V/VO	19
8.5700E-02	8.4655E-02	8.4655E-02	1.3021E+00	7.6800E-01	1.0124E-01	V/VO	19
1.1100E-01	1.1133E-01	1.1133E-01	1.3736E+00	7.2800E-01	1.2475E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 5.77886E-04(MB)


G E PHENOLIC FIBERGLASS
PRESSURE (MB)
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
.040
.080
.120
.160
.200
.240
.280
.320
.360
.400
MU

CUBIC FIT TO EQUATION OF STATE FOR CHOPPED NYLON PHENOLIC

RHO(0)= 1.21000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF= .6540

AMU= 7.73527E-03(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 2.550E-01(CM/MICROSEC)

CS= 7.995E-02(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 1.910E-04

SPECIFIC HEAT(CP)= 1.650E+07

CB= 2.377E-01(CM/MICROSEC)

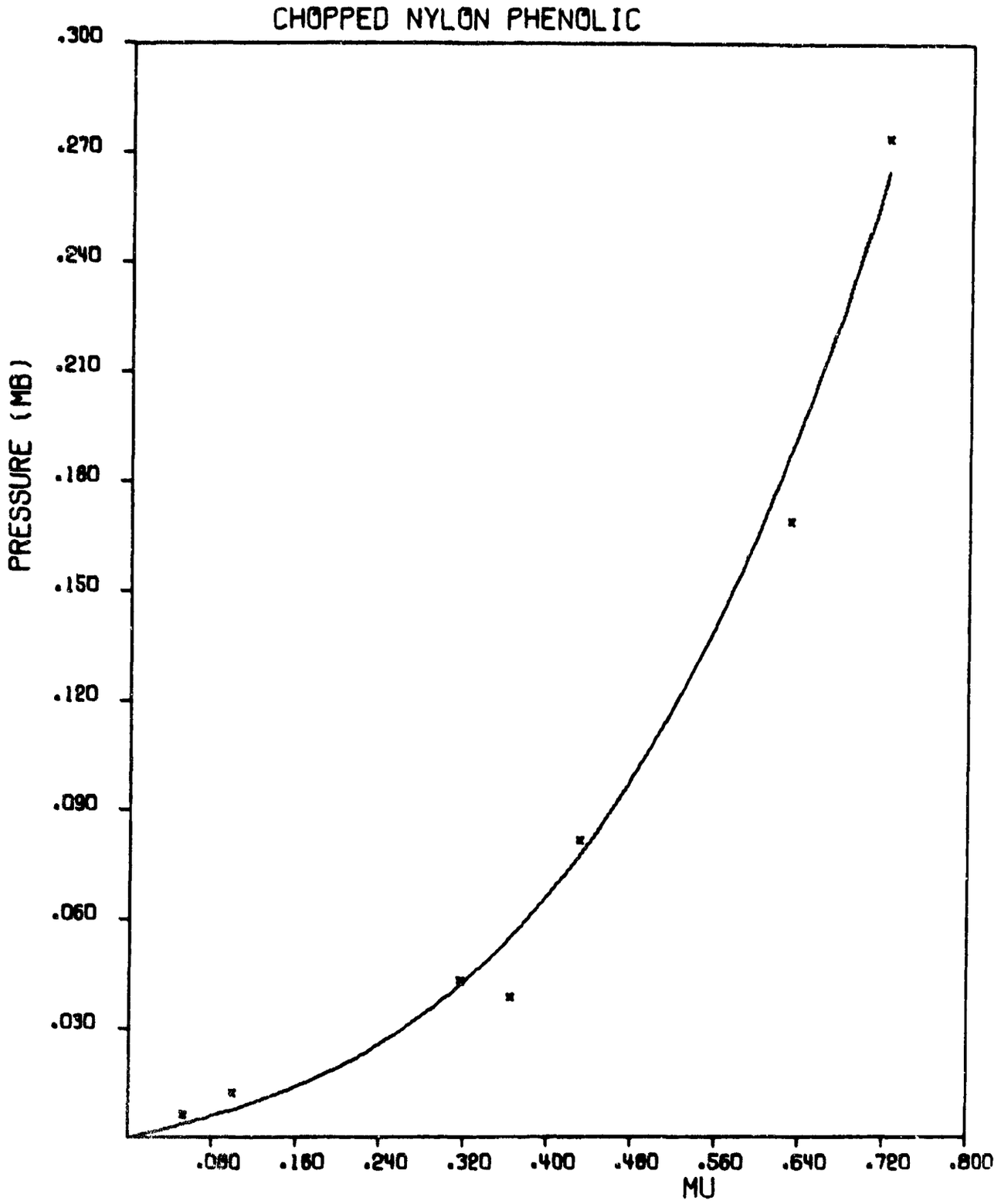
SLOPE OF US-UP= 1.6057

IN THE FIRST PLASTIC WAVE C1= .06837 * D1= .03724 S1= .52168

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
6.1500E-03	3.8057E-03	3.8057E-03	1.0530E+00	9.4967E-01	1.5994E-02	ETA	45
1.2200E-02	7.6394E-03	7.6394E-03	1.0990E+00	9.0992E-01	3.0137E-02	ETA	45
4.2900E-02	4.2032E-02	4.2032E-02	1.3170E+00	7.5930E-01	9.2379E-02	ETA	45
8.1600E-02	7.7760E-02	7.7760E-02	1.4300E+00	6.9930E-01	1.4240E-01	ETA	45
3.8600E-02	5.5282E-02	5.5282E-02	1.3650E+00	7.3260E-01	9.2359E-02	ETA	30
1.6900E-01	1.8829E-01	1.8829E-01	1.6300E+00	6.1350E-01	2.3234E-01	ETA	30
2.7400E-01	2.6511E-01	2.6511E-01	1.7220E+00	5.8072E-01	3.0813E-01	ETA	30

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 8.06792E-03(MB)


CHOPPED NYLON PHENOLIC
PRESSURE (MB)
.300
.270
.240
.210
.180
.150
.120
.090
.060
.030
.080
.160
.240
.320
.400
.480
.560
.640
.720
.800
MU

CUBIC FIT TO EQUATION OF STATE FOR TAPE WOUND NYLON PHENOLIC

$R_0(0)$= 1.22000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF= 1.8637

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 3.120E-04

SPECIFIC HEAT(CP)= 1.710E+07

CB= 3.196E-01(CM/MICROSEC)

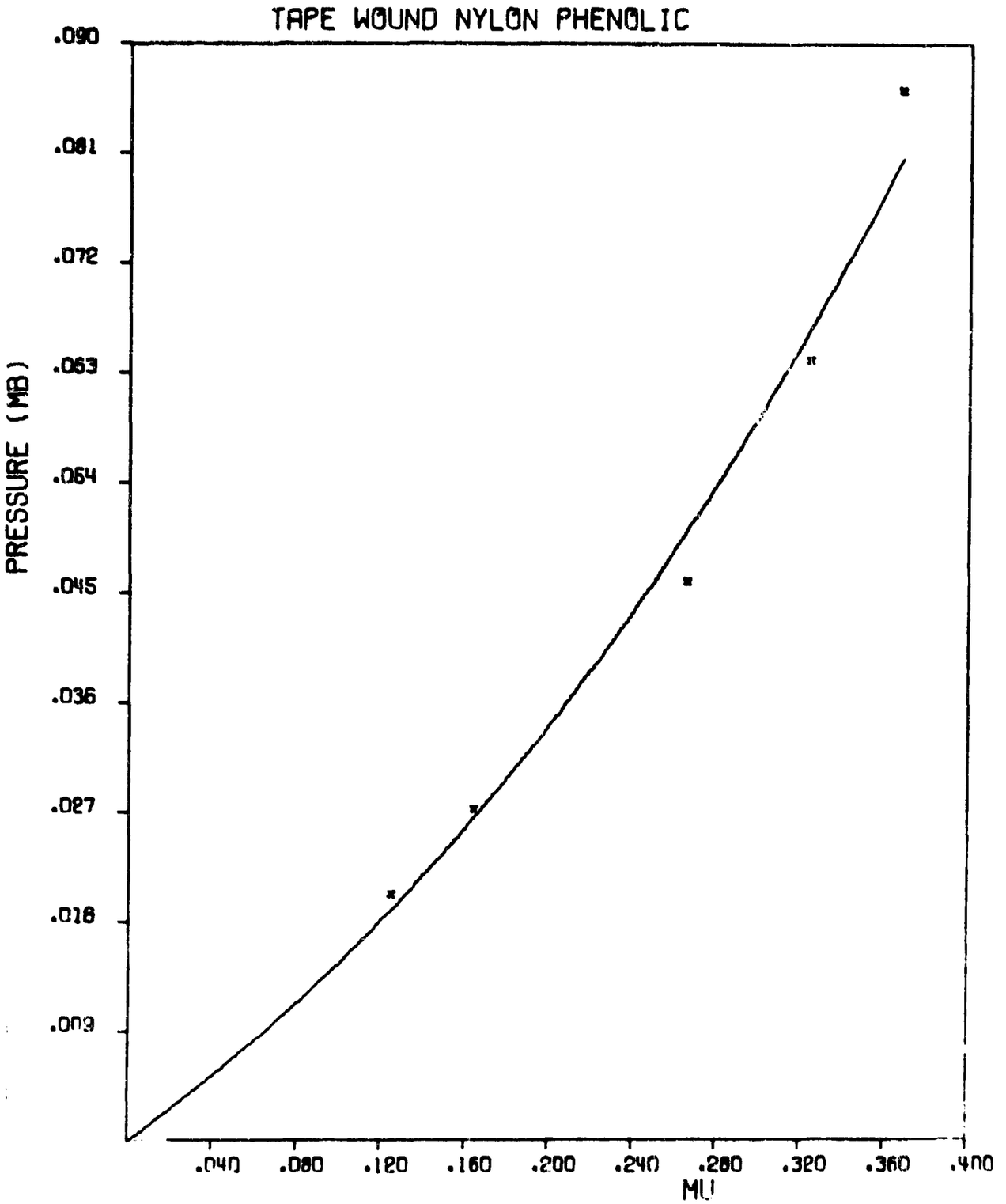
SLOPE OF US-UP= 1.3192

IN THE FIRST PLASTIC WAVE C1= .12462 * D1= .19916 S1= .15422

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.0200E-02	1.8965E-02	1.8965E-02	1.1249E+00	8.8900E-01	4.2870E-02	V/VO	19
2.7200E-02	2.6503E-02	2.6503E-02	1.1641E+00	8.5900E-01	5.6068E-02	V/VO	19
4.5800E-02	5.0096E-02	5.0096E-02	1.2658E+00	7.9000E-01	8.8790E-02	V/VO	19
6.4000E-02	6.6680E-02	6.6680E-02	1.3245E+00	7.5500E-01	1.1337E-01	V/VO	19
8.6100E-02	8.0512E-02	8.0512E-02	1.3680E+00	7.3100E-01	1.3778E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 2.89926E-03(MB)


TAPE WOUND NYLON PHENOLIC
.090
.081
.072
.063
.054
.045
.036
.027
.018
.009
PRESSURE (MB)
.040
.080
.120
.160
.200
.240
.280
.320
.360
.400
MU

CUBIC FIT TO EQUATION OF STATE FOR QUARTZ PHENOLIC

RHO(0)= 1.80000

SUBLIMATION ENERGY= 1.20510E+11

GRUNEISEN COEF= .2899

AKU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 2.500E-05

SPECIFIC HEAT(CP)= 8.620E+06

CB= 3.156E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.0296

IN THE FIRST PLASTIC WAVE C1= .17929 * D1= .18977 S1= .01160

IN THE SECOND PLASTIC WAVE C2= .10654 * D2= .09108 S2= 1.89423

INFLECTION POINT PRESSURE(MB) = 2.00000E-01 MU = .65000

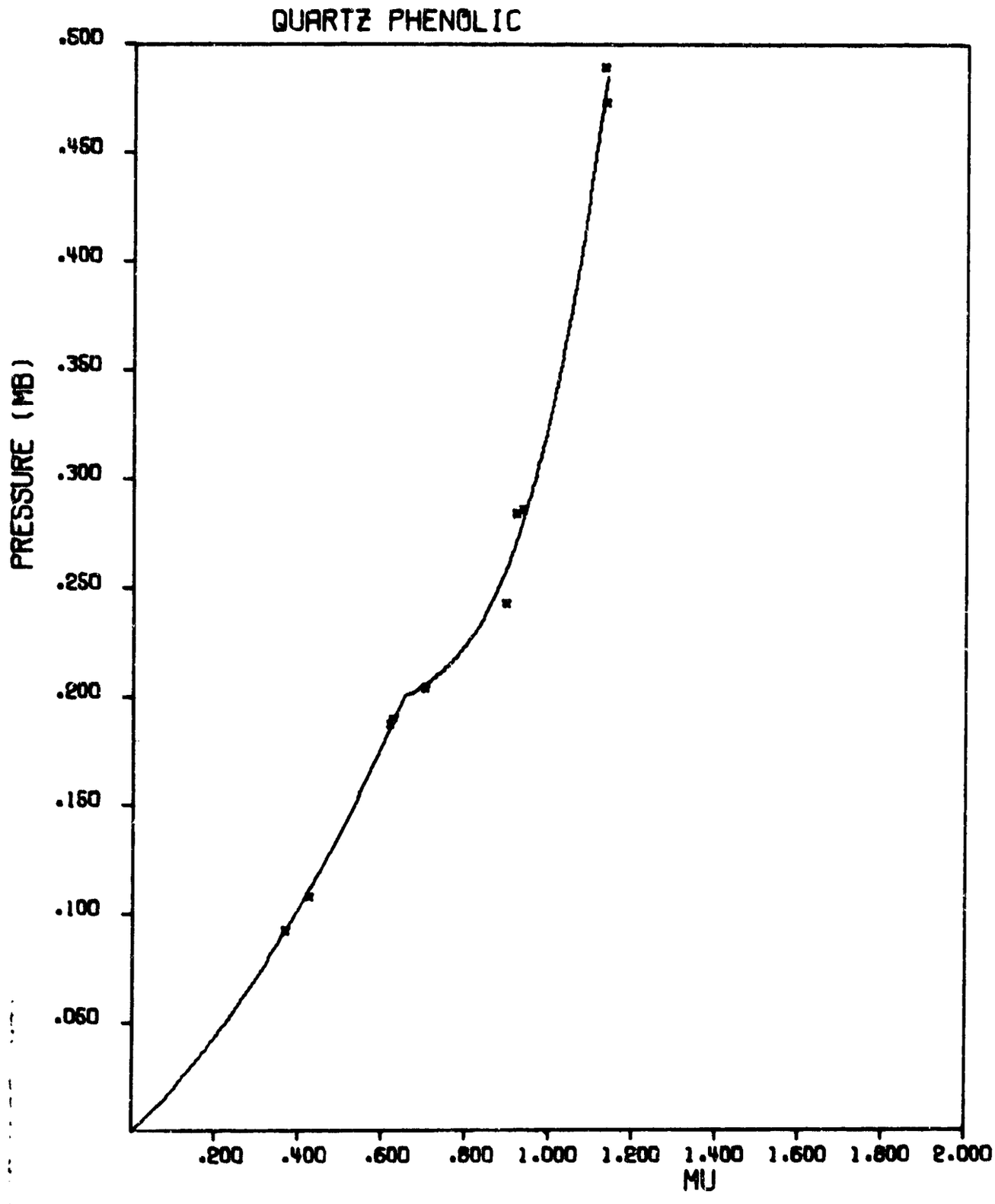
CB = .1894 SLOPE = -0. RHO = 2.9700

III

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.0800E-01	1.1190E-01	1.1190E-01	1.4265E+00	7.0100E-01	1.3394E-01	V/VO	34
9.2000E-02	9.2252E-02	9.2252E-02	1.3680E+00	7.3100E-01	1.1726E-01	V/VO	34
1.8700E-01	1.8607E-01	1.8607E-01	1.6181E+00	6.1800E-01	1.9921E-01	V/VO	34
1.9000E-01	1.8945E-01	1.8945E-01	1.6260E+00	6.1500E-01	2.0159E-01	V/VO	34
2.0400E-01	2.0588E-01	2.0588E-01	1.7007E+00	5.8800E-01	2.1609E-01	V/VO	34
2.4300E-01	2.5891E-01	2.5891E-01	1.8939E+00	5.2800E-01	2.5243E-01	V/VO	34
4.8900E-01	4.7811E-01	4.7811E-01	2.1277E+00	4.7000E-01	3.7945E-01	V/VO	34
2.8400E-01	2.7234E-01	2.7234E-01	1.9194E+00	5.2100E-01	2.7491E-01	V/VO	34
2.8600E-01	2.8114E-01	2.8114E-01	1.9342E+00	5.1700E-01	2.7703E-01	V/VO	34
4.7300E-01	4.8493E-01	4.8493E-01	2.1322E+00	4.6900E-01	3.7354E-01	V/VO	34

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 6.27519E-03(MB)


QUARTZ PHENOLIC
PRESSURE (MB)
.500
.450
.400
.350
.300
.250
.200
.150
.100
.050
.200
.400
.600
.800
1.000
1.200
1.400
1.600
1.800
2.000
MU

CUBIC FIT TO EQUATION OF STATE FOR 3-D QUARTZ PHENOLIC

$R_{H}O(0)$= 1.65000

SUBLIMATION ENERGY= 1.08840E+11

GRUNEISEN COEF=-0. *NO DATA

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 3.200E-01(CM/MICROSEC)

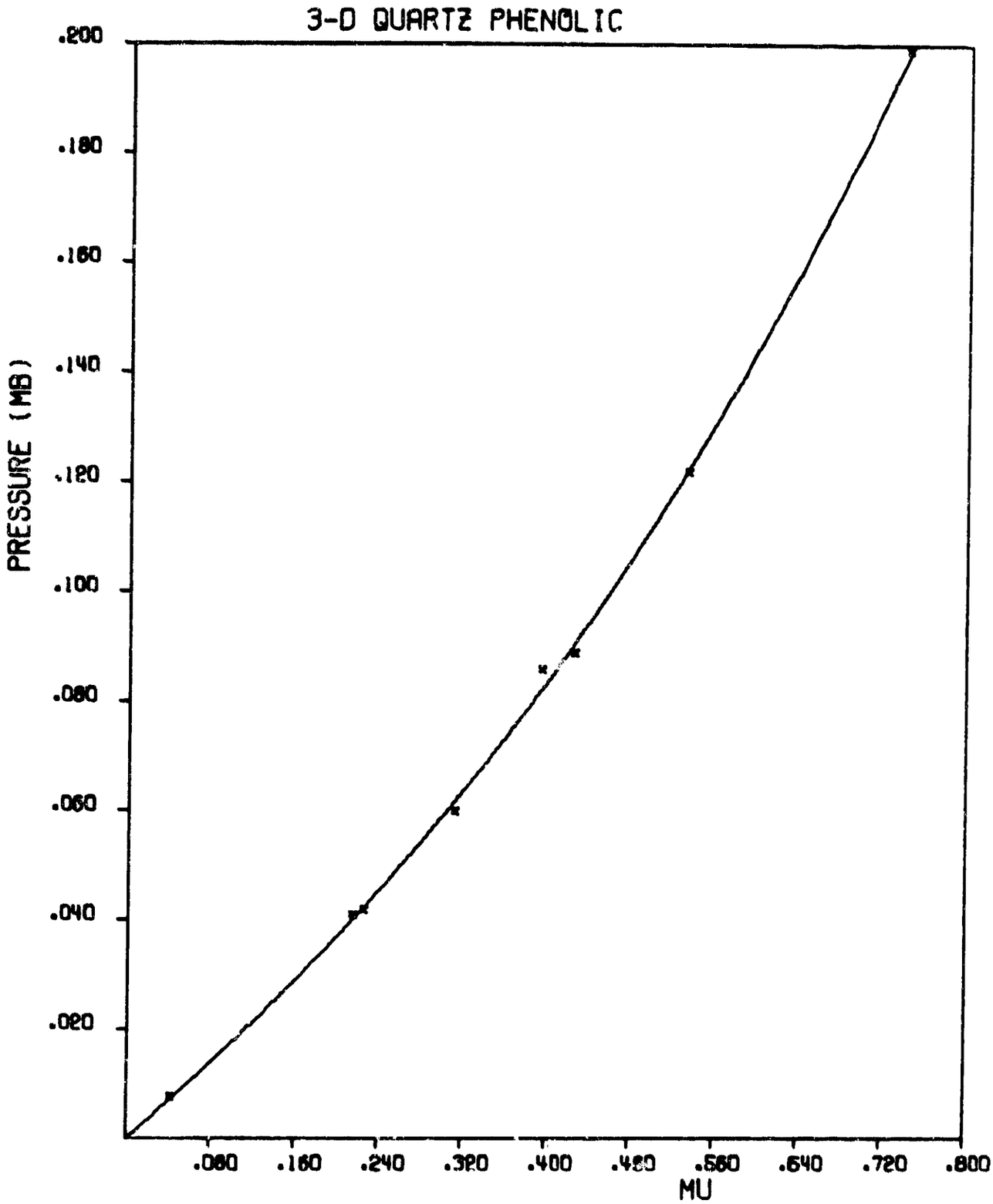
SLOPE OF US-UP= .9600

IN THE FIRST PLASTIC WAVE C1= .16896 * D1= .06304 S1= .09473

P(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
4.10000E-02	4.01960E-02	1.21507E+00	8.23000E-01	6.63188E-02	V/VO	27
4.20000E-02	4.23904E-02	1.22549E+00	8.16000E-01	6.84371E-02	V/VO	27
6.00000E-02	6.18088E-02	1.31234E+00	7.62000E-01	9.30298E-02	V/VO	27
7.53000E-03	7.21455E-03	1.04200E+00	9.59693E-01	1.35627E-02	ETA	23
8.60000E-02	8.23349E-02	1.39470E+00	7.17000E-01	1.21451E-01	V/VO	27
8.90000E-02	9.08877E-02	1.42653E+00	7.01000E-01	1.26996E-01	V/VO	27
1.22000E-01	1.22545E-01	1.53374E+00	6.52000E-01	1.60409E-01	V/VO	27
1.99000E-01	1.98843E-01	1.74216E+00	5.74000E-01	2.26668E-01	V/VO	27

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.19661E-03(MB)


3-D QUARTZ PHENOLIC
PRESSURE (MB)
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
.080
.160
.240
.320
.400
.480
.560
.640
.720
.800
MU

CUBIC FIT TO EQUATION OF STATE FOR X-CUT CRYSTALLINE QUARTZ (ELASTIC REGION)

RHO(0)= 2.65000

SUBLIMATION ENERGY= 2.35200E+11

GRUNEISEN COEF= .7800

AMU= 3.70077E-01(MB)

YO = 4.25338E-02(MB)

YMU= 5.74661E-02

HUGONIOT ELASTIC LIMIT = 5.00000E-02(MB)

CL= 5.730E-01(CM/MICROSEC)

CS= 3.737E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 3.770E-01(CM/MICROSEC)

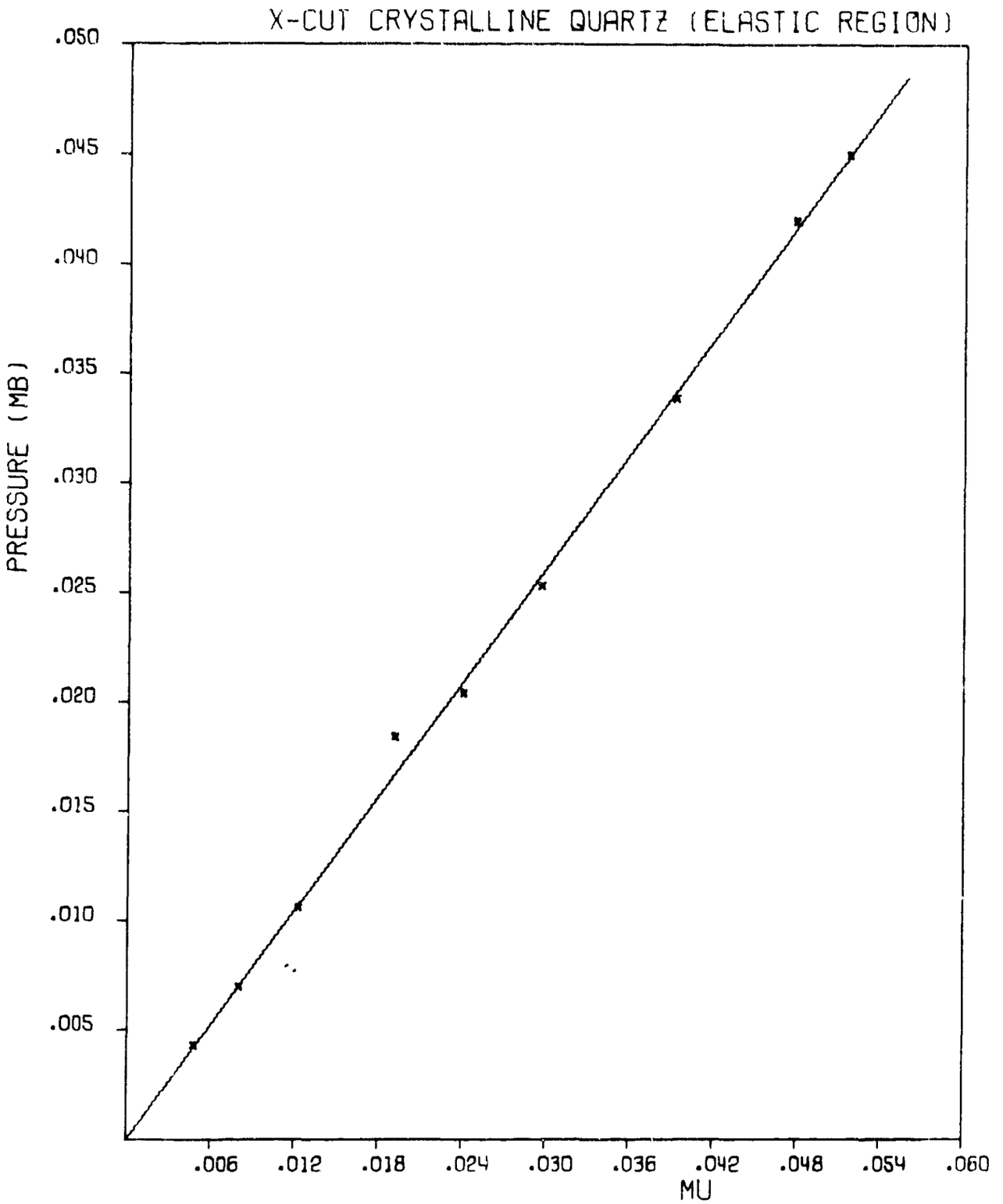
SLOPE OF US-UP= -0.

IN THE ELASTIC WAVE C0= .87008

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
4.3000E-03	4.2634E-03	0.	1.0049E+00	9.9512E-01	2.8129E-03	ETA	49
7.0000E-03	7.0476E-03	0.	1.0081E+00	9.9197E-01	4.8070E-03	ETA	49
1.0000E-02	1.0702E-02	0.	1.0123E+00	9.8785E-01	6.9715E-03	ETA	49
1.8400E-02	1.6705E-02	0.	1.0192E+00	9.8116E-01	1.1437E-02	ETA	49
2.0400E-02	2.0882E-02	0.	1.0240E+00	9.7656E-01	1.3432E-02	ETA	49
2.5290E-02	2.5841E-02	0.	1.0297E+00	9.7116E-01	1.6591E-02	ETA	49
3.3870E-02	3.4194E-02	0.	1.0393E+00	9.6219E-01	2.1984E-02	ETA	49
4.1960E-02	4.1590E-02	0.	1.0478E+00	9.5438E-01	2.6876E-02	ETA	49
4.4960E-02	4.4896E-02	0.	1.0516E+00	9.5093E-01	2.8853E-02	ETA	49

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 5.08024E-04(MB)


X-CUT CRYSTALLINE QUARTZ (ELASTIC REGION)
PRESSURE (MB)
.050
.045
.040
.035
.030
.025
.020
.015
.010
.005
.006
.012
.018
.024
.030
.036
.042
.048
.054
.060
MU

CUBIC FIT TO EQUATION OF STATE FOR PHENOLIC REFRASIL

RHO(0)= 1.65000

SUBLIMATION ENERGY= 6.00000E+10

GRUNEISEN COEF=-0. *NO DATA

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 3.007E-01(CM/MICROSEC)

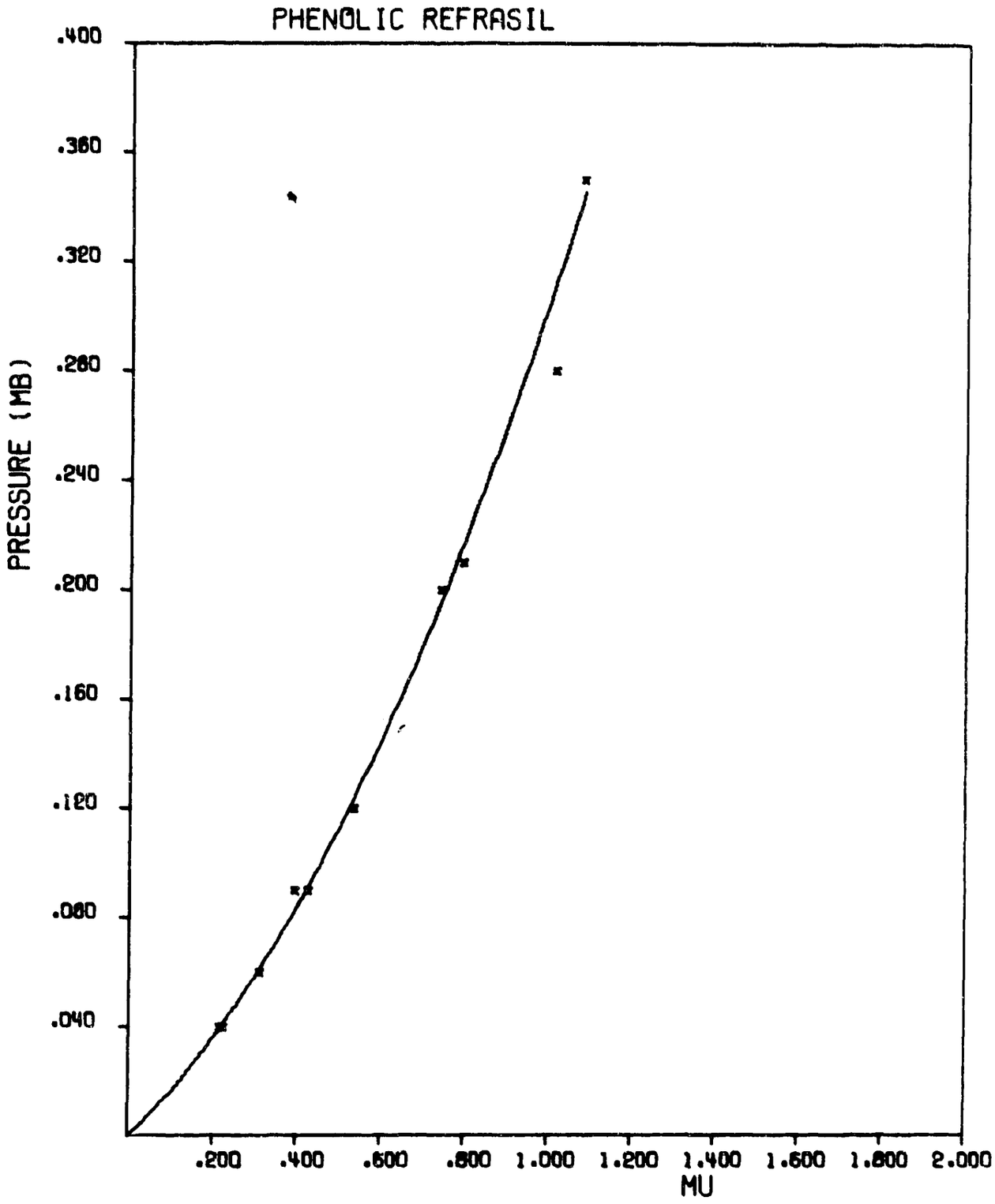
SLOPE OF US-UP= 1.0117

IN THE FIRST PLASTIC WAVE C1= .14919 * D1= .15265 S1= .00365

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
4.0000E-02	3.9184E-02	3.9184E-02	1.2151E+00	8.2300E-01	6.5505E-02	V/VO	20
4.0000E-02	4.1445E-02	4.1445E-02	1.2255E+00	8.1600E-01	6.6788E-02	V/VO	20
6.0000E-02	6.1601E-02	6.1601E-02	1.3123E+00	7.6200E-01	9.3030E-02	V/VO	20
9.0000E-02	8.2892E-02	8.2892E-02	1.3947E+00	7.1700E-01	1.2424E-01	V/VO	20
9.0000E-02	9.1691E-02	9.1691E-02	1.4265E+00	7.0100E-01	1.2771E-01	V/VO	20
1.2000E-01	1.2442E-01	1.2442E-01	1.5361E+00	6.5100E-01	1.5932E-01	V/VO	20
2.0000E-01	1.9630E-01	1.9630E-01	1.7422E+00	5.7400E-01	2.2724E-01	V/VO	20
2.1000E-01	2.1705E-01	2.1705E-01	1.7953E+00	5.5700E-01	2.3745E-01	V/VO	20
2.8000E-01	3.1305E-01	3.1305E-01	2.0161E+00	4.9600E-01	2.9245E-01	V/VO	20
3.5000E-01	3.4542E-01	3.4542E-01	2.0833E+00	4.8000E-01	3.3212E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 6.54594E-03(MB)


PHENOLIC REFRASIL
PRESSURE (MB)
.400
.360
.320
.280
.240
.200
.160
.120
.080
.040
.200
.400
.600
.800
1.000
1.200
1.400
1.600
1.800
2.000
MU

CUBIC FIT TO EQUATION OF STATE FOR PLATINUM

RHO(0)= 21.37000

SUBLIMATION ENERGY= 2.85900E+10

GRUNEISEN COEF= 2.6146

AMU= 6.84716E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 4.080E-01(CM/MICROSEC)

CS= 1.790E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 2.670E-05

SPECIFIC HEAT(CP)= 1.348E+08

CB= 3.636E-01(CM/MICROSEC)

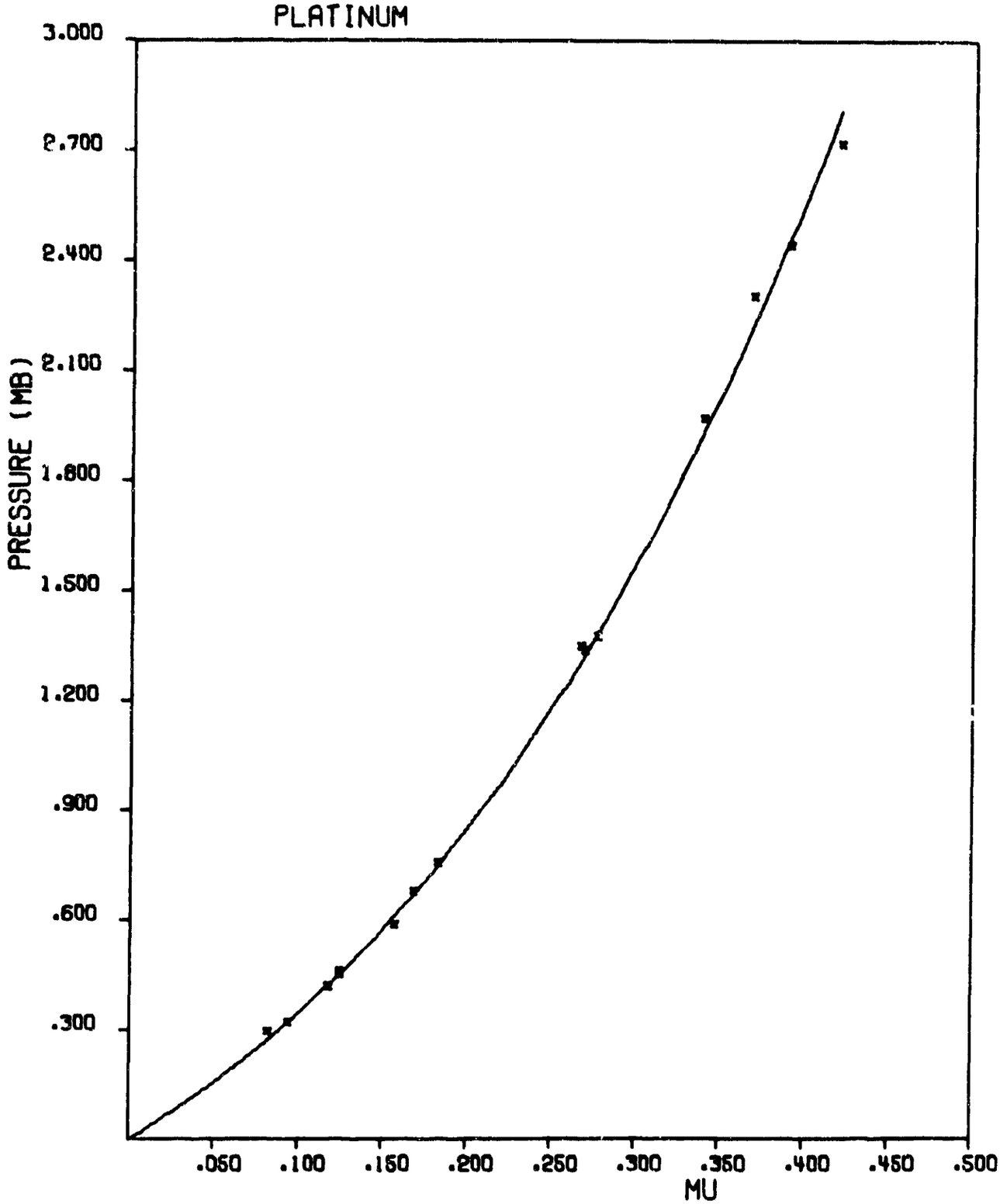
SLOPE OF US-UP= 1.5395

IN THE FIRST PLASTIC WAVE C1= 2.82522 * D1= 5.29683 S1= 9.25661

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.9500E-01	2.7427E-01	2.7427E-01	1.0825E+00	9.2380E-01	3.2433E-02	V/VO	13
4.1650E-01	4.2320E-01	4.2320E-01	1.1182E+00	8.9430E-01	4.5388E-02	V/VO	13
5.8600E-01	6.1067E-01	6.1067E-01	1.1571E+00	8.6420E-01	6.1023E-02	V/VO	13
3.2240E-01	3.2092E-01	3.2092E-01	1.0942E+00	9.1390E-01	3.6041E-02	V/VO	17
4.5180E-01	4.5104E-01	4.5104E-01	1.1244E+00	8.8940E-01	4.8356E-02	V/VO	17
4.6030E-01	4.5277E-01	4.5277E-01	1.1247E+00	8.8910E-01	4.8875E-02	V/VO	17
6.7730E-01	6.7071E-01	6.7071E-01	1.1685E+00	8.5580E-01	6.7604E-02	V/VO	17
7.5570E-01	7.4961E-01	7.4961E-01	1.1827E+00	8.4550E-01	7.3916E-02	V/VO	17
1.3357E+00	1.3262E+00	1.3262E+00	1.2694E+00	7.8780E-01	1.1517E-01	V/VO	17
1.3492E+00	1.3089E+00	1.3089E+00	1.2671E+00	7.8920E-01	1.1536E-01	V/VO	17
1.3761E+00	1.3843E+00	1.3843E+00	1.2768E+00	7.8320E-01	1.1816E-01	V/VO	17
1.9667E+00	1.9362E+00	1.9362E+00	1.3399E+00	7.4630E-01	1.5240E-01	V/VO	17
2.3010E+00	2.2221E+00	2.2221E+00	1.3684E+00	7.3080E-01	1.7025E-01	V/VO	17
2.4383E+00	2.4593E+00	2.4593E+00	1.3902E+00	7.1930E-01	1.7896E-01	V/VO	17
2.7181E+00	2.8074E+00	2.8074E+00	1.4201E+00	7.0420E-01	1.9397E-01	V/VO	17

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 2.34756E-02(MB)


PLATINUM
3.000
2.700
2.400
2.100
1.800
1.500
1.200
.900
.600
.300
PRESSURE (MB)
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR PLEXIGLAS

$R_{MO}(0)$= 1.18600

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF= .8000

AMU= 2.32456E-02(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 2.720E-01(CM/MICROSEC)

CS= 1.400E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 1.650E-04

SPECIFIC HEAT(CP)= 8.244E+06

CB= 2.745E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.4508

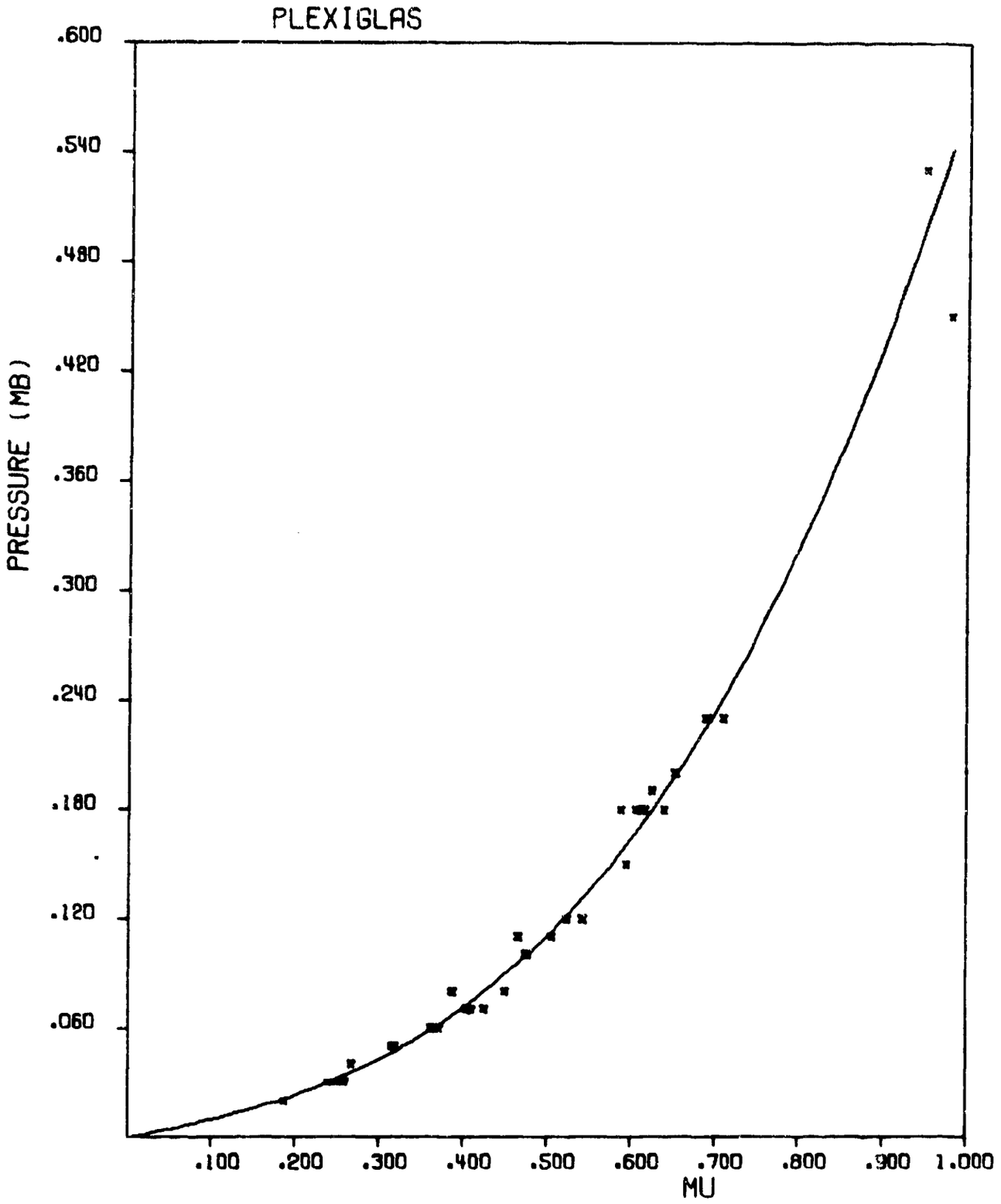
IN THE FIRST PLASTIC WAVE C1= .08937 * D1= .04566 S1= .43556

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.0000E-02	2.1255E-02	2.1255E-02	1.1876E+00	8.4200E-01	5.1618E-02	V/VO	20
3.0000E-02	3.0229E-02	3.0229E-02	1.2407E+00	8.0600E-01	7.0052E-02	V/VO	20
3.0000E-02	3.2305E-02	3.2305E-02	1.2516E+00	7.9900E-01	7.1304E-02	V/VO	20
3.0000E-02	3.3866E-02	3.3866E-02	1.2594E+00	7.9400E-01	7.2186E-02	V/VO	20
4.0000E-02	3.5495E-02	3.5495E-02	1.2674E+00	7.8900E-01	8.4359E-02	V/VO	20
5.0000E-02	4.6491E-02	4.6491E-02	1.3158E+00	7.6000E-01	1.0059E-01	V/VO	20
5.0000E-02	4.7359E-02	4.7359E-02	1.3193E+00	7.5800E-01	1.0101E-01	V/VO	20
6.0000E-02	5.9113E-02	5.9113E-02	1.3624E+00	7.3400E-01	1.1600E-01	V/VO	20
6.0000E-02	6.0215E-02	6.0215E-02	1.3661E+00	7.3200E-01	1.1644E-01	V/VO	20
6.0000E-02	6.1907E-02	6.1907E-02	1.3717E+00	7.2900E-01	1.1709E-01	V/VO	20
8.0000E-02	6.7276E-02	6.7276E-02	1.3889E+00	7.2000E-01	1.3743E-01	V/VO	20
8.0000E-02	6.6657E-02	6.6657E-02	1.3870E+00	7.2100E-01	1.3718E-01	V/VO	20
7.0000E-02	7.2445E-02	7.2445E-02	1.4045E+00	7.1200E-01	1.3038E-01	V/VO	20
7.0000E-02	7.4487E-02	7.4487E-02	1.4104E+00	7.0900E-01	1.3105E-01	V/VO	20
7.0000E-02	8.0224E-02	8.0224E-02	1.4265E+00	7.0100E-01	1.3284E-01	V/VO	20
8.0000E-02	8.9698E-02	8.9698E-02	1.4514E+00	6.8900E-01	1.4484E-01	V/VO	20
1.0000E-01	9.9400E-02	9.9400E-02	1.4749E+00	6.7800E-01	1.6477E-01	V/VO	20
1.0000E-01	1.0033E-01	1.0033E-01	1.4771E+00	6.7700E-01	1.6503E-01	V/VO	20
1.1000E-01	9.5751E-02	9.5751E-02	1.4663E+00	6.8200E-01	1.7174E-01	V/VO	20
1.1000E-01	9.5751E-02	9.5751E-02	1.4663E+00	6.8200E-01	1.7174E-01	V/VO	20
1.1000E-01	1.1335E-01	1.1335E-01	1.5060E+00	6.6400E-01	1.7653E-01	V/VO	20
1.2000E-01	1.3183E-01	1.3183E-01	1.5432E+00	6.4800E-01	1.8872E-01	V/VO	20
1.2000E-01	1.3183E-01	1.3183E-01	1.5432E+00	6.4800E-01	1.8872E-01	V/VO	20
1.2000E-01	1.2223E-01	1.2223E-01	1.5244E+00	6.5600E-01	1.8656E-01	V/VO	20
1.5000E-01	1.6102E-01	1.6102E-01	1.5949E+00	6.2700E-01	2.1720E-01	V/VO	20
1.8000E-01	1.5647E-01	1.5647E-01	1.5873E+00	6.3000E-01	2.3697E-01	V/VO	20
1.8000E-01	1.7056E-01	1.7056E-01	1.6103E+00	6.2100E-01	2.3984E-01	V/VO	20
1.8000E-01	1.7387E-01	1.7387E-01	1.6155E+00	6.1900E-01	2.4047E-01	V/VO	20
1.8000E-01	1.6732E-01	1.6732E-01	1.6051E+00	6.2300E-01	2.3920E-01	V/VO	20
1.8000E-01	1.7221E-01	1.7221E-01	1.6129E+00	6.2000E-01	2.4015E-01	V/VO	20
1.8000E-01	1.8963E-01	1.8963E-01	1.6393E+00	6.1000E-01	2.4329E-01	V/VO	20
1.9000E-01	1.7896E-01	1.7896E-01	1.6234E+00	6.1600E-01	2.4803E-01	V/VO	20
2.0000E-01	1.9903E-01	1.9903E-01	1.6529E+00	6.0500E-01	2.5809E-01	V/VO	20
2.0000E-01	1.9903E-01	1.9903E-01	1.6529E+00	6.0500E-01	2.5809E-01	V/VO	20
2.3000E-01	2.2586E-01	2.2586E-01	1.6892E+00	5.9200E-01	2.8129E-01	V/VO	20
2.3000E-01	2.2586E-01	2.2586E-01	1.6892E+00	5.9200E-01	2.8129E-01	V/VO	20
2.3000E-01	2.4187E-01	2.4187E-01	1.7094E+00	5.8500E-01	2.8369E-01	V/VO	20
2.3000E-01	2.4187E-01	2.4187E-01	1.7094E+00	5.8500E-01	2.8369E-01	V/VO	20

4.5000E-01	5.4166E-01	5.4166E-01	1.9802E+00	5.0500E-01	4.3338E-01	V/VO	20
5.3000E-01	4.9862E-01	4.9862E-01	1.9493E+00	5.1300E-01	4.6651E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 9.52961E-03(MB)


PLEXIGLAS
.600
.540
.480
.420
.360
.300
.240
.180
.120
.060
PRESSURE (MB)
.100
.200
.300
.400
.500
.600
.700
.800
.900
1.000
MU

CUBIC FIT TO EQUATION OF STATE FOR POLYETHYLENE

RHO(0)= .92000

SUBLIMATION ENERGY= 4.40000E+10

GRUNEISEN COEF= .8600

AMU= 2.68272E-03(MB)

YO = 1.38000E-04(MB)

YMU= 2.57202E-02

HUGONIOT ELASTIC LIMIT = 2.12479E-03(MB)

CL= 1.950E-01(CM/MICROSEC)

CS= 5.400E-02(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 6.000E-06

SPECIFIC HEAT(CP)= 2.303E+07

CB= 2.931E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.4720

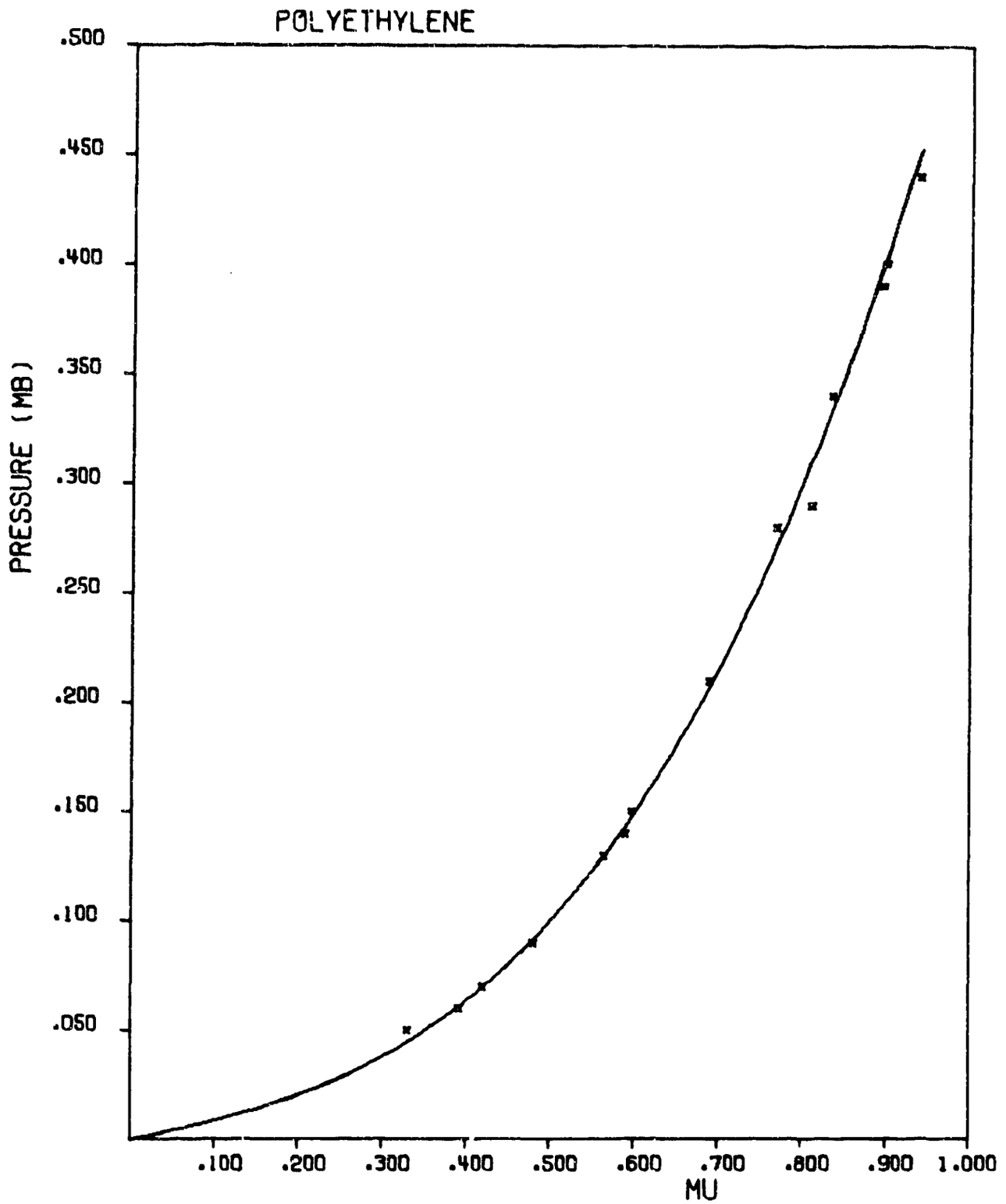
IN THE ELASTIC WAVE C0= .08261

IN THE FIRST PLASTIC WAVE C1= .07904 * D1= .02299 S1= .43370

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
5.0000E-02	4.4631E-02	4.4539E-02	1.3316E+00	7.5100E-01	1.1633E-01	V/VO	19
6.0000E-02	6.0956E-02	6.0864E-02	1.3928E+00	7.1800E-01	1.3561E-01	V/VO	19
7.0000E-02	6.9623E-02	6.9531E-02	1.4205E+00	7.0400E-01	1.5007E-01	V/VO	19
9.0000E-02	9.1884E-02	9.1792E-02	1.4815E+00	6.7500E-01	1.7831E-01	V/VO	19
1.3000E-01	1.3028E-01	1.3019E-01	1.5649E+00	6.3900E-01	2.2586E-01	V/VO	19
1.4000E-01	1.4370E-01	1.4361E-01	1.5898E+00	6.2900E-01	2.3761E-01	V/VO	19
1.5000E-01	1.4800E-01	1.4791E-01	1.5974E+00	6.2600E-01	2.4694E-01	V/VO	19
2.1000E-01	2.0745E-01	2.0736E-01	1.6892E+00	5.9200E-01	3.0517E-01	V/VO	19
2.8000E-01	2.7250E-01	2.7241E-01	1.7699E+00	5.6500E-01	3.6386E-01	V/VO	19
2.9000E-01	3.1123E-01	3.1114E-01	1.8116E+00	5.5200E-01	3.7579E-01	V/VO	19
3.4000E-01	3.3447E-01	3.3437E-01	1.8349E+00	5.4500E-01	4.1006E-01	V/VO	19
3.9000E-01	3.9894E-01	3.9885E-01	1.8939E+00	5.2800E-01	4.4731E-01	V/VO	19
4.0000E-01	4.0312E-01	4.0303E-01	1.8975E+00	5.2700E-01	4.5349E-01	V/VO	19
4.4000E-01	4.5236E-01	4.5227E-01	1.9380E+00	5.1600E-01	4.8112E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 5.41408E-03(MB)


POLYETHYLENE
PRESSURE (MB)
.500
.450
.400
.350
.300
.250
.200
.150
.100
.050
.100
.200
.300
.400
.500
.600
.700
.800
.900
1.000
MU

CUBIC FIT TO EQUATION OF STATE FOR POLYSTYRENE

RHO(0)= 1.05000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF=-0. *NO DATA

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 1.650E-04

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 2.990E-01(CM/MICROSEC)

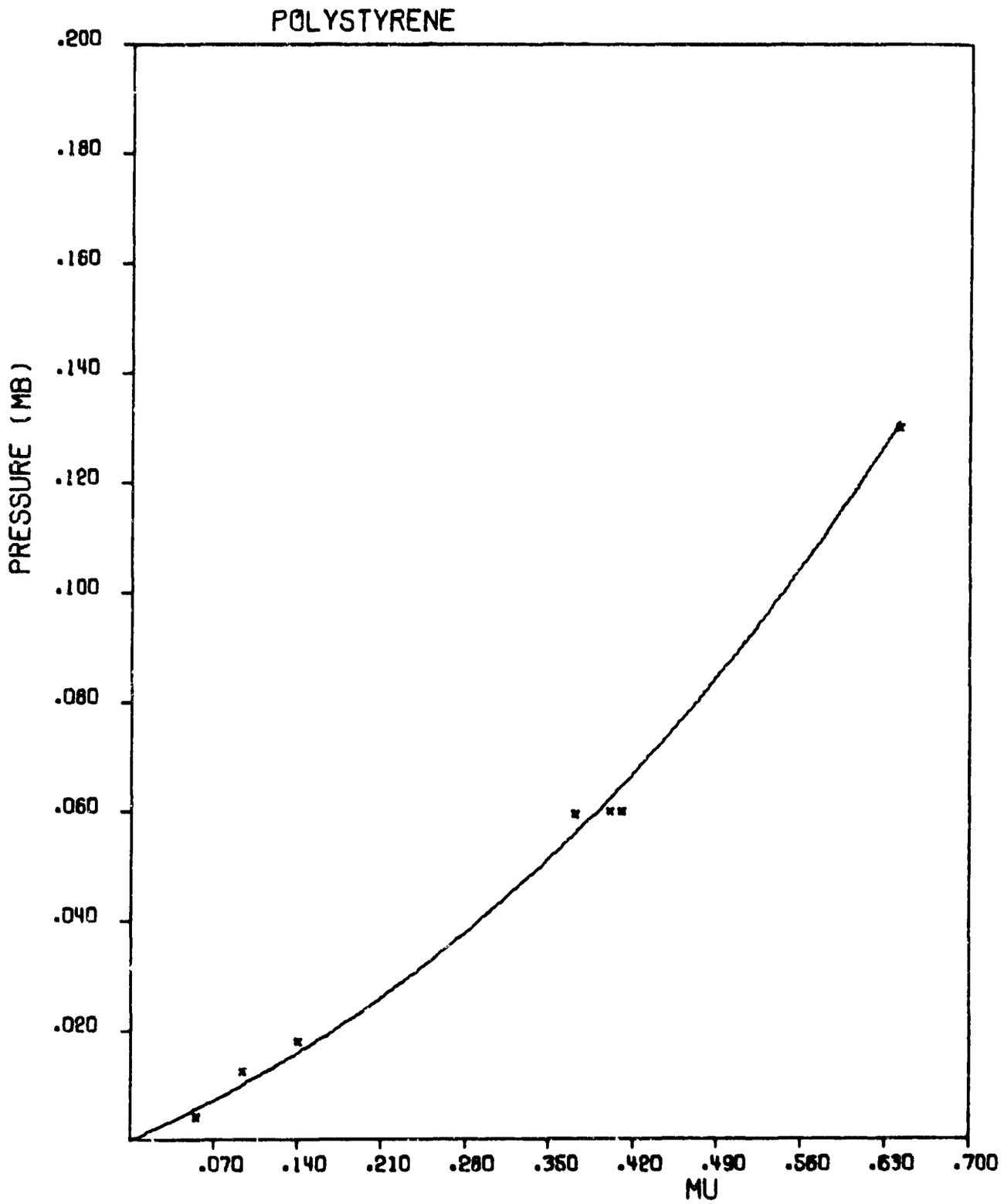
SLOPE OF US-UP= 1.2038

IN THE FIRST PLASTIC WAVE C1= .09387 * D1= .12743 S1= .06873

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
6.0000E-02	6.4747E-02	6.4747E-02	1.4104E+00	7.0900E-01	1.2895E-01	V/VO	20
6.0000E-02	6.2464E-02	6.2464E-02	1.4006E+00	7.1400E-01	1.2784E-01	V/VO	20
1.3000E-01	1.3098E-01	1.3098E-01	1.6420E+00	6.0900E-01	2.2002E-01	V/VO	20
4.0700E-03	5.5438E-03	5.5438E-03	1.0549E+00	9.4800E-01	1.4197E-02	V/VO	19
1.2500E-02	1.0018E-02	1.0018E-02	1.0941E+00	9.1400E-01	3.1997E-02	V/VO	19
1.7900E-02	1.5862E-02	1.5862E-02	1.1403E+00	8.7700E-01	4.5791E-02	V/VO	19
5.9300E-02	5.6036E-02	5.6036E-02	1.3717E+00	7.2900E-01	1.2371E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 2.49330E-03(MB)


POLYSTYRENE
PRESSURE (MB)
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
.070
.140
.210
.280
.350
.420
.490
.560
.630
.700
MU

CUBIC FIT TO EQUATION OF STATE FOR POLYURETHANE

RHO(0)= 1.26500

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF=-0. *NO DATA

AMU= 1.34204E-02(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 2.390E-01(CM/MICROSEC)

CS= 1.030E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 2.070E-01(CM/MICROSEC)

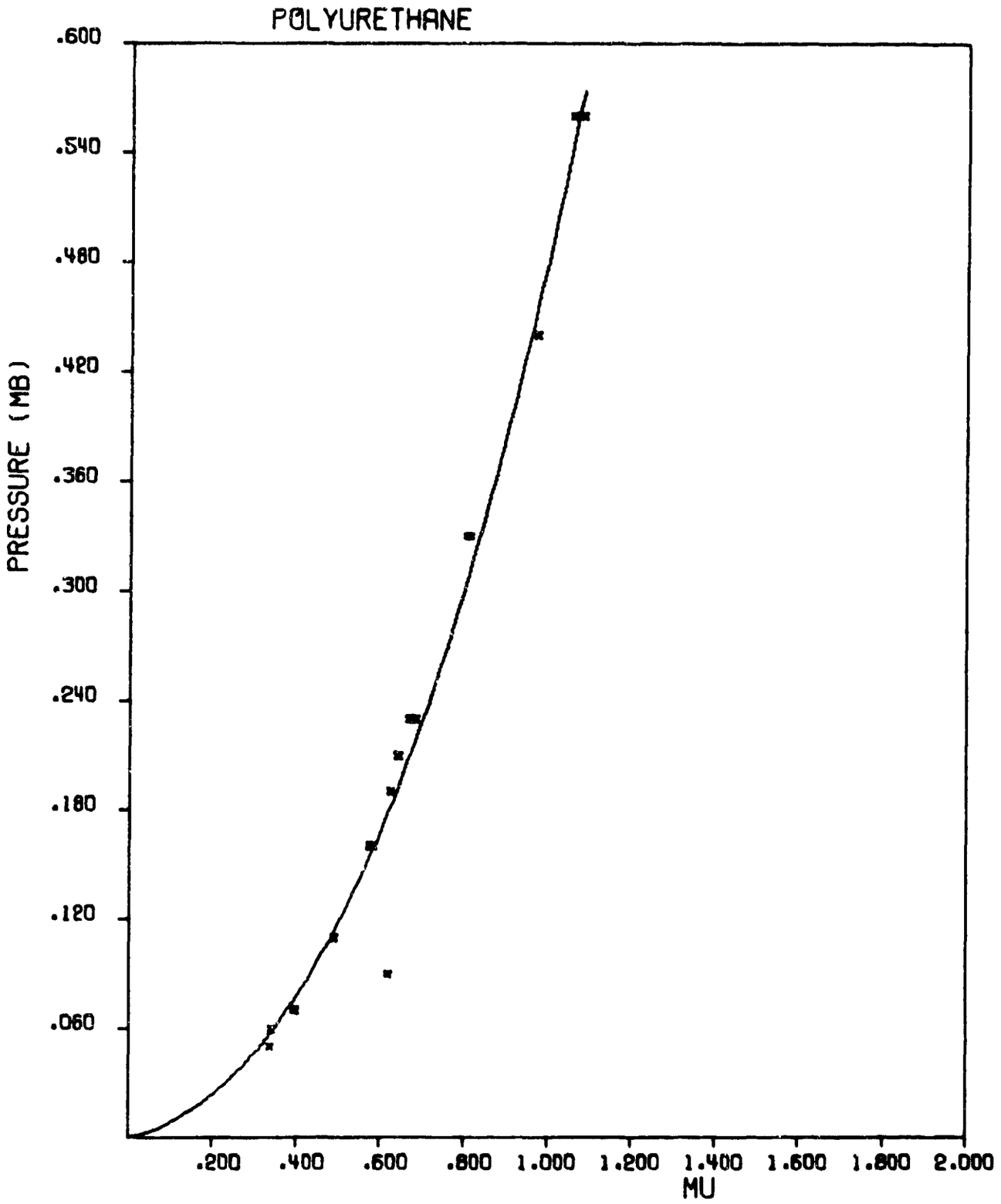
SLOPE OF US-UP= -0.

IN THE FIRST PLASTIC WAVE C1= .05420 * D1= .29291 S1= .13846

P(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
5.00000E-02	5.73367E-02	1.33869E+00	7.47000E-01	1.00000E-01	V/VO	20
6.00000E-02	6.84214E-02	1.34228E+00	7.45000E-01	1.09977E-01	V/VO	20
7.00000E-02	7.62234E-02	1.39665E+00	7.16000E-01	1.25361E-01	V/VO	20
7.00000E-02	7.69125E-02	1.39860E+00	7.15000E-01	1.25582E-01	V/VO	20
1.10000E-01	1.14299E-01	1.49254E+00	6.70000E-01	1.69398E-01	V/VO	20
1.10000E-01	1.14299E-01	1.49254E+00	6.70000E-01	1.69398E-01	V/VO	20
1.60000E-01	1.54228E-01	1.57480E+00	6.35000E-01	2.14863E-01	V/VO	20
1.60000E-01	1.59554E-01	1.58479E+00	6.31000E-01	2.16037E-01	V/VO	20
9.00000E-02	1.79630E-01	1.62075E+00	6.17000E-01	1.65073E-01	V/VO	20
1.90000E-01	1.82691E-01	1.62602E+00	6.15000E-01	2.40471E-01	V/VO	20
2.10000E-01	1.92185E-01	1.64204E+00	6.09000E-01	2.54773E-01	V/VO	20
2.10000E-01	1.93813E-01	1.64474E+00	6.08000E-01	2.55098E-01	V/VO	20
2.30000E-01	2.09098E-01	1.66945E+00	5.99000E-01	2.70017E-01	V/VO	20
2.30000E-01	2.12654E-01	1.67504E+00	5.97000E-01	2.70689E-01	V/VO	20
2.30000E-01	2.19946E-01	1.68634E+00	5.93000E-01	2.72029E-01	V/VO	20
3.30000E-01	3.05718E-01	1.80505E+00	5.54000E-01	3.41098E-01	V/VO	20
3.30000E-01	3.10945E-01	1.81159E+00	5.52000E-01	3.41862E-01	V/VO	20
4.40000E-01	4.56967E-01	1.97239E+00	5.07000E-01	4.14099E-01	V/VO	20
4.40000E-01	4.56967E-01	1.97239E+00	5.07000E-01	4.14099E-01	V/VO	20
5.60000E-01	5.43959E-01	2.05339E+00	4.87000E-01	4.76549E-01	V/VO	20
5.60000E-01	5.73442E-01	2.07900E+00	4.81000E-01	4.79328E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.53744E-02(MB)


POLYURETHANE
.600
.540
.480
.420
.360
.300
.240
.180
.120
.060
PRESSURE (MB)
.200
.400
.600
.800
1.000
1.200
1.400
1.600
1.800
2.000
MU

CUBIC FIT TO EQUATION OF STATE FOR RAD 588 (LOW PRESSURE)

RHO(0)= 1.26000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF=-0. *NO DATA

AMU= 5.52371E-02(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 2.700E-01(CM/MICROSEC)

CS= 2.094E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 1.200E-04

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 1.202E-01(CM/MICROSEC)

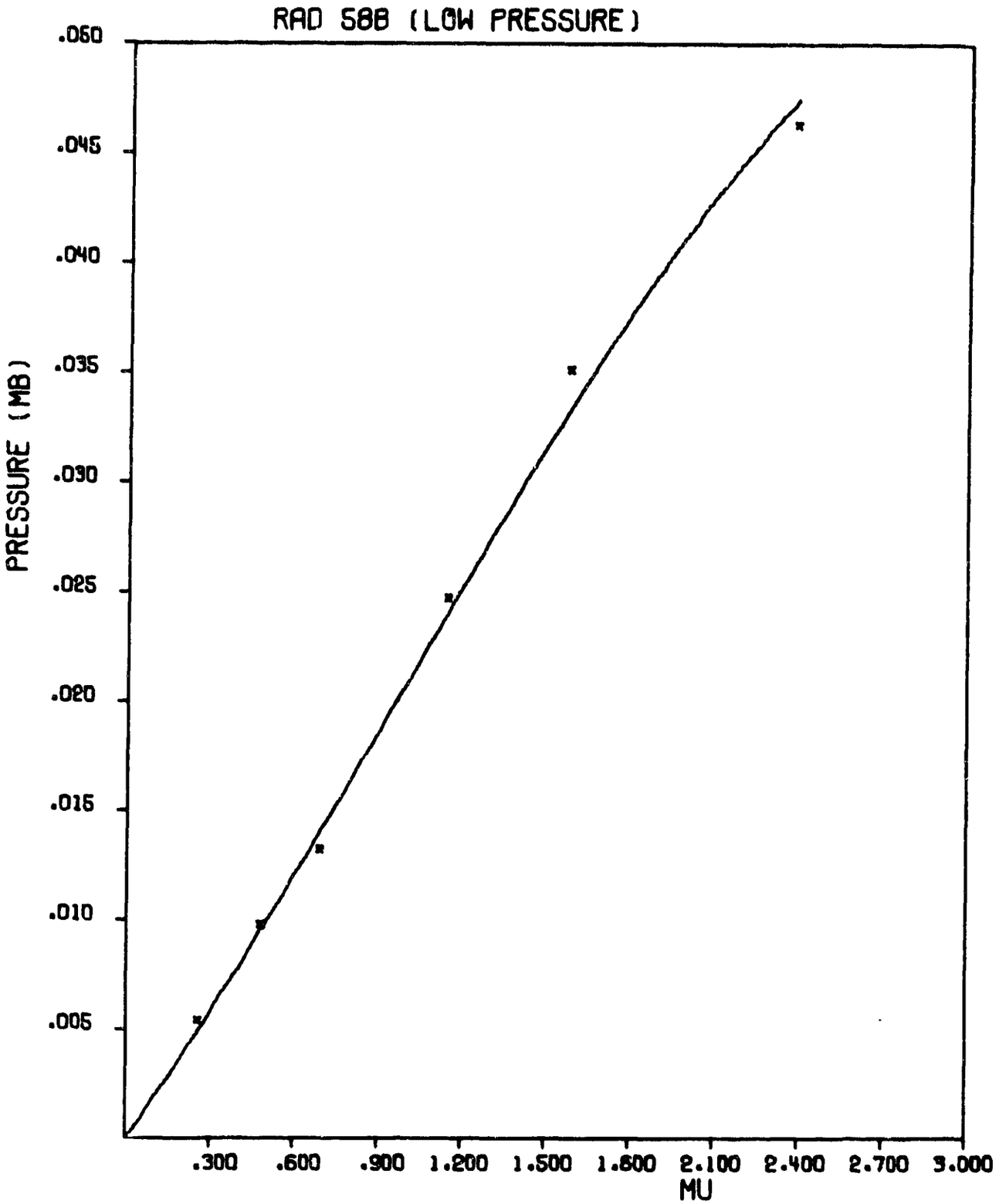
SLOPE OF US-UP= .6832

IN THE FIRST PLASTIC WAVE C1= .01820 * D1= .00409 S1= -.00141

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
5.3900E-03	4.9736E-03	4.9736E-03	1.2594E+00	7.9400E-01	2.9685E-02	V/VO	19
9.7700E-03	9.6017E-03	9.6017E-03	1.4837E+00	6.7400E-01	5.0277E-02	V/VO	19
1.3200E-02	1.4088E-02	1.4088E-02	1.6920E+00	5.9100E-01	6.5458E-02	V/VO	19
2.4700E-02	2.4002E-02	2.4002E-02	2.1413E+00	4.6700E-01	1.0222E-01	V/VO	19
3.5100E-02	3.3341E-02	3.3341E-02	2.5773E+00	3.8800E-01	1.3057E-01	V/VO	19
4.6300E-02	4.7414E-02	4.7414E-02	3.3784E+00	2.9600E-01	1.6084E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 8.40604E-04(MB)


RAD 588 (LOW PRESSURE)
PRESSURE (MB)
.060
.045
.040
.035
.030
.025
.020
.015
.010
.005
.300
.600
.900
1.200
1.500
1.800
2.100
2.400
2.700
3.000
MU

CUBIC FIT TO EQUATION OF STATE FOR OBLIQUE TAPE WOUND REFRASIL

RHO(0)= 1.66000

SUBLIMATION ENERGY= 1.76000E+11

GRUNFISEN COEF= .6400

AMU= 1.5446A7E-02(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 3.360E-01(CM/MICROSEC)

CS= 9.646E-02(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 2.000E-05

SPECIFIC HEAT(CP)= 1.929E+07

CB= 3.170E-01(CM/MICROSEC)

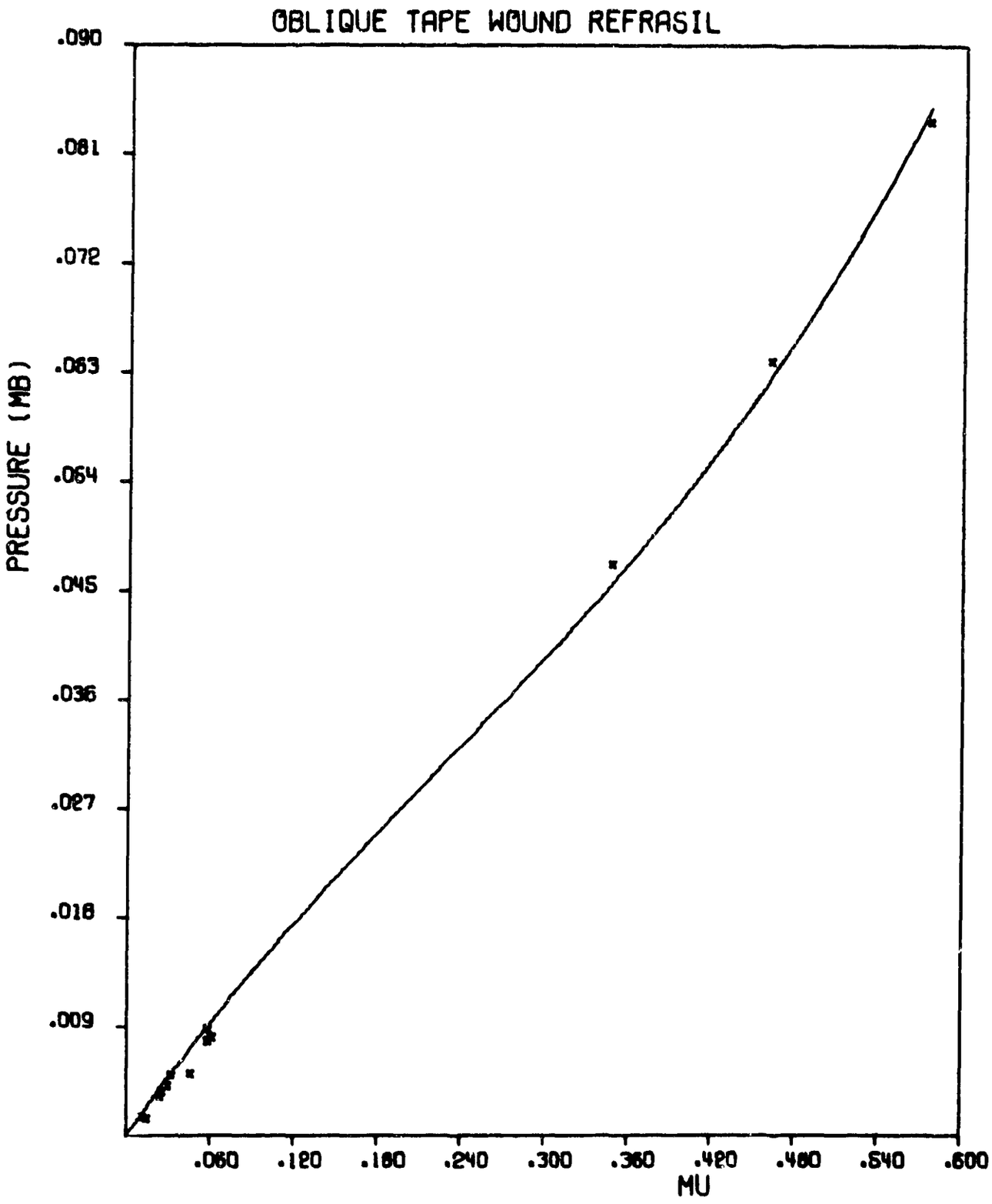
SLOPE OF US-UP= -0.

IN THE FIRST PLASTIC WAVE C1= .16681 * D1= -.20652 S1= .30133

P(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.54000E-03	1.81034E-03	1.01100E+00	9.89120E-01	3.17707E-03	ETA	1
3.24000E-03	3.98318E-03	1.02460E+00	9.75990E-01	6.84565E-03	V/VO	31
3.64000E-03	4.13992E-03	1.02560E+00	9.75040E-01	7.39808E-03	V/VO	31
4.14000E-03	4.78003E-03	1.02970E+00	9.71157E-01	8.48143E-03	ETA	1
4.99000E-03	5.16727E-03	1.03220E+00	9.68804E-01	9.68372E-03	ETA	1
5.17000E-03	7.26615E-03	1.04600E+00	9.56020E-01	1.17036E-02	V/VO	31
7.77000E-03	9.05371E-03	1.05810E+00	9.45090E-01	1.60318E-02	ETA	1
8.21000E-03	9.50443E-03	1.06120E+00	9.42329E-01	1.68886E-02	ETA	1
8.79000E-03	9.14118E-03	1.05870E+00	9.44555E-01	1.71346E-02	ETA	1
1.46000E-03	2.42455E-03	1.01480E+00	9.85416E-01	3.58148E-03	ETA	1
4.72000E-02	4.57002E-02	1.34771E+00	7.42000E-01	8.56499E-02	V/VO	19
6.39000E-02	6.26980E-02	1.46199E+00	6.84000E-01	1.10291E-01	V/VO	19
8.36000E-02	8.48751E-02	1.57480E+00	6.35000E-01	1.35580E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 9.45968E-04(MB)


OBLIQUE TAPE WOUND REFRASIL
.090
.081
.072
.063
.054
.045
.036
.027
.018
.009
PRESSURE (MB)
.060
.120
.180
.240
.300
.360
.420
.480
.540
.600
MU

CUBIC FIT TO EQUATION OF STATE FOR SERIES 124 RESIN

$R_{H}O(0)$= 1.22000

SUBLIMATION ENERGY= 3.23000E+10

GRUNEISEN COEF= .9000

AMU= 8.2296AE-03(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 2.450E-01(CM/MICROSEC)

CS= 8.213E-02(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 2.259E-01(CM/MICROSEC)

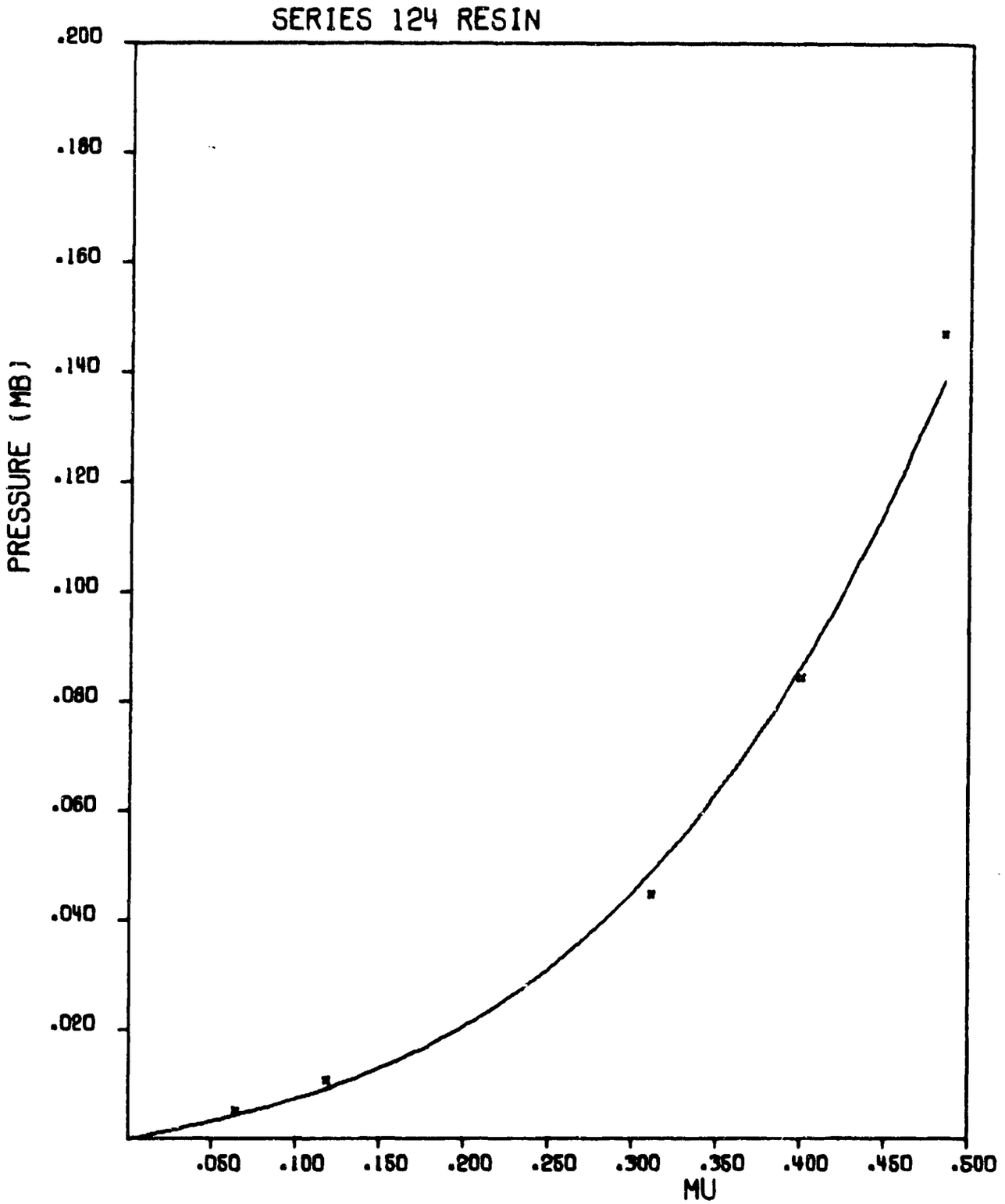
SLOPE OF US-UP= 1.8939

IN THE FIRST PLASTIC WAVE C1= .06226 * D1= .02182 S1= .90495

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
5.1000E-03	4.3875E-03	4.3875E-03	1.0650E+00	9.3897E-01	1.5973E-02	ETA	45
1.0700E-02	9.2426E-03	9.2426E-03	1.1190E+00	8.9366E-01	3.0540E-02	ETA	45
4.4600E-02	4.8694E-02	4.8694E-02	1.3110E+00	7.6278E-01	9.3125E-02	ETA	30
8.4400E-02	8.6311E-02	8.6311E-02	1.4000E+00	7.1429E-01	1.4059E-01	ETA	30
1.4700E-01	1.3857E-01	1.3857E-01	1.4850E+00	6.7340E-01	1.9837E-01	ETA	30

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 3.32133E-03(MB)


SERIES 124 RESIN
PRESSURE (MB)
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR SILVER

RHO(0)= 10.49000

SUBLIMATION ENERGY= 2.59360E+10

GRUNEISEN COEF= 2.4664

AMU= 2.65198E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 3.600E-01(CM/MICROSEC)

CS= 1.590E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 5.760E-05

SPECIFIC HEAT(CP)= 2.551E+06

CB= 3.305E-01(CM/MICROSEC)

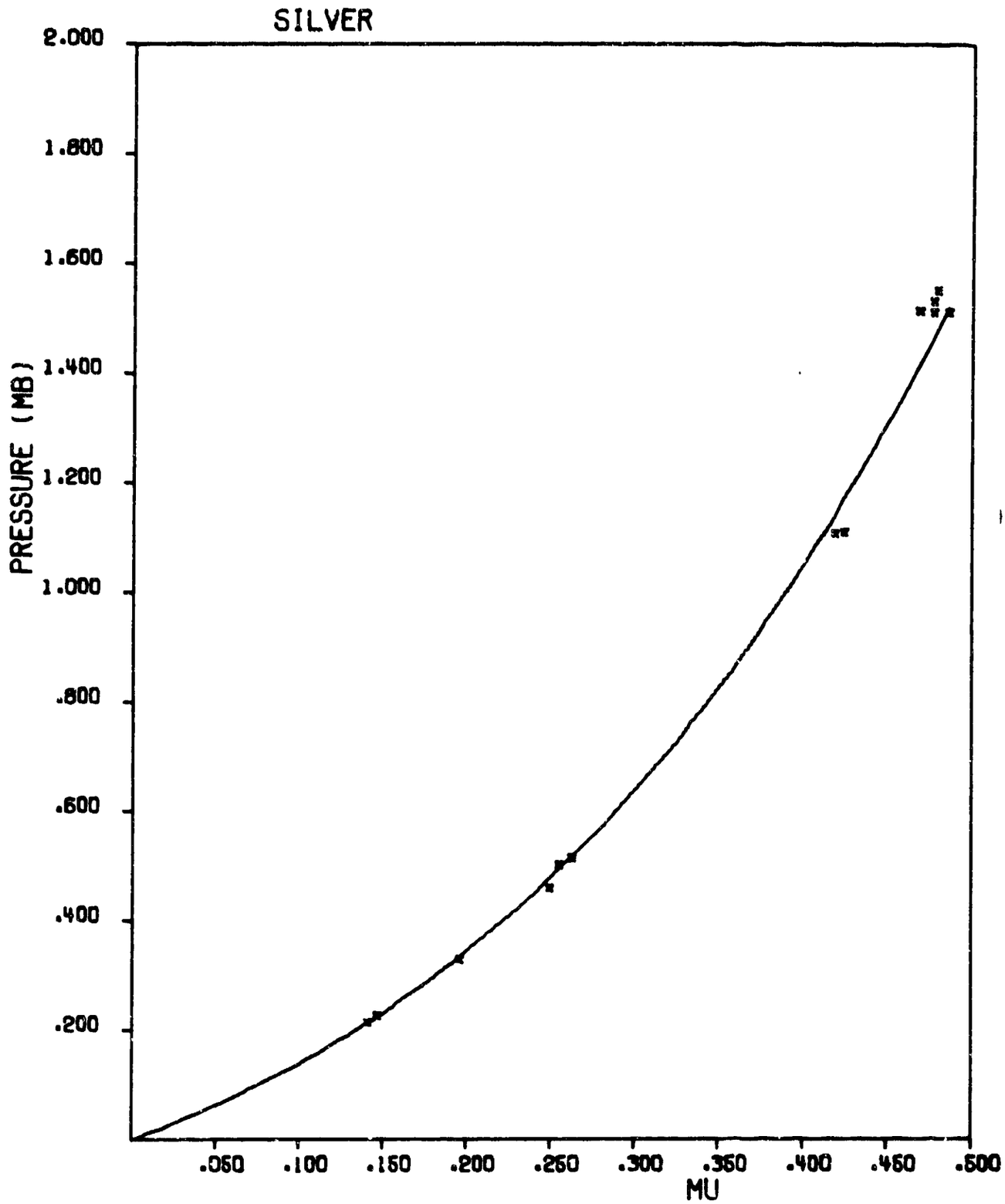
SLOPE OF US-UP= 1.5401

IN THE FIRST PLASTIC WAVE C1= 1.14583 * D1= 2.01967 S1= 4.21170

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.1490E-01	2.1461E-01	2.1461E-01	1.1416E+00	8.7600E-01	5.0401E-02	V/VO	13
2.2740E-01	2.2530E-01	2.2530E-01	1.1469E+00	8.7190E-01	5.2697E-02	V/VO	13
3.2930E-01	3.3361E-01	3.3361E-01	1.1959E+00	8.3620E-01	7.1708E-02	V/VO	13
4.6000E-01	4.7849E-01	4.7849E-01	1.2500E+00	8.0000E-01	9.3650E-02	V/VO	16
5.0070E-01	4.9388E-01	4.9388E-01	1.2552E+00	7.9670E-01	9.8508E-02	V/VO	13
5.1360E-01	5.1799E-01	5.1799E-01	1.2631E+00	7.9170E-01	1.0099E-01	V/VO	13
1.1070E+00	1.1417E+00	1.1417E+00	1.4184E+00	7.0500E-01	1.7644E-01	V/VO	5
1.1090E+00	1.1725E+00	1.1725E+00	1.4245E+00	7.0200E-01	1.7750E-01	V/VO	5
1.5090E+00	1.5167E+00	1.5167E+00	1.4859E+00	6.7300E-01	2.1689E-01	V/VO	5
1.5100E+00	1.4638E+00	1.4638E+00	1.4771E+00	6.7700E-01	2.1563E-01	V/VO	5
1.5120E+00	1.4128E+00	1.4128E+00	1.4684E+00	6.8100E-01	2.1443E-01	V/VO	5
1.5300E+00	1.4638E+00	1.4638E+00	1.4771E+00	6.7700E-01	2.1705E-01	V/VO	5
1.5500E+00	1.4769E+00	1.4769E+00	1.4793E+00	6.7600E-01	2.1880E-01	V/VO	16

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 3.28431E-02(MB)


SILVER
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR STAINLESS STEEL TYPE 304

RHO(0)= 7.89600

SUBLIMATION ENERGY= -0. *NO DATA

CL= 5.770E-01(CM/MICROSEC)

GRUNEISEN COEF= 1.164R

CS= 3.120E-01(CM/MICROSEC)

AMU= 7.6862RE-01(MB)

THERMAL COEF OF EXPANSION(VOL)= 1.492E-04

YO = 1.32694E-03(MB)

SPECIFIC HEAT(CP)= 2.660E+07

YMU= 4.63188E-04

CB= 4.557E-01(CM/MICROSEC)

HUGONIOT ELASTIC LIMIT = 2.30000E-03(MB)

SLOPE OF US-UP= 1.5059

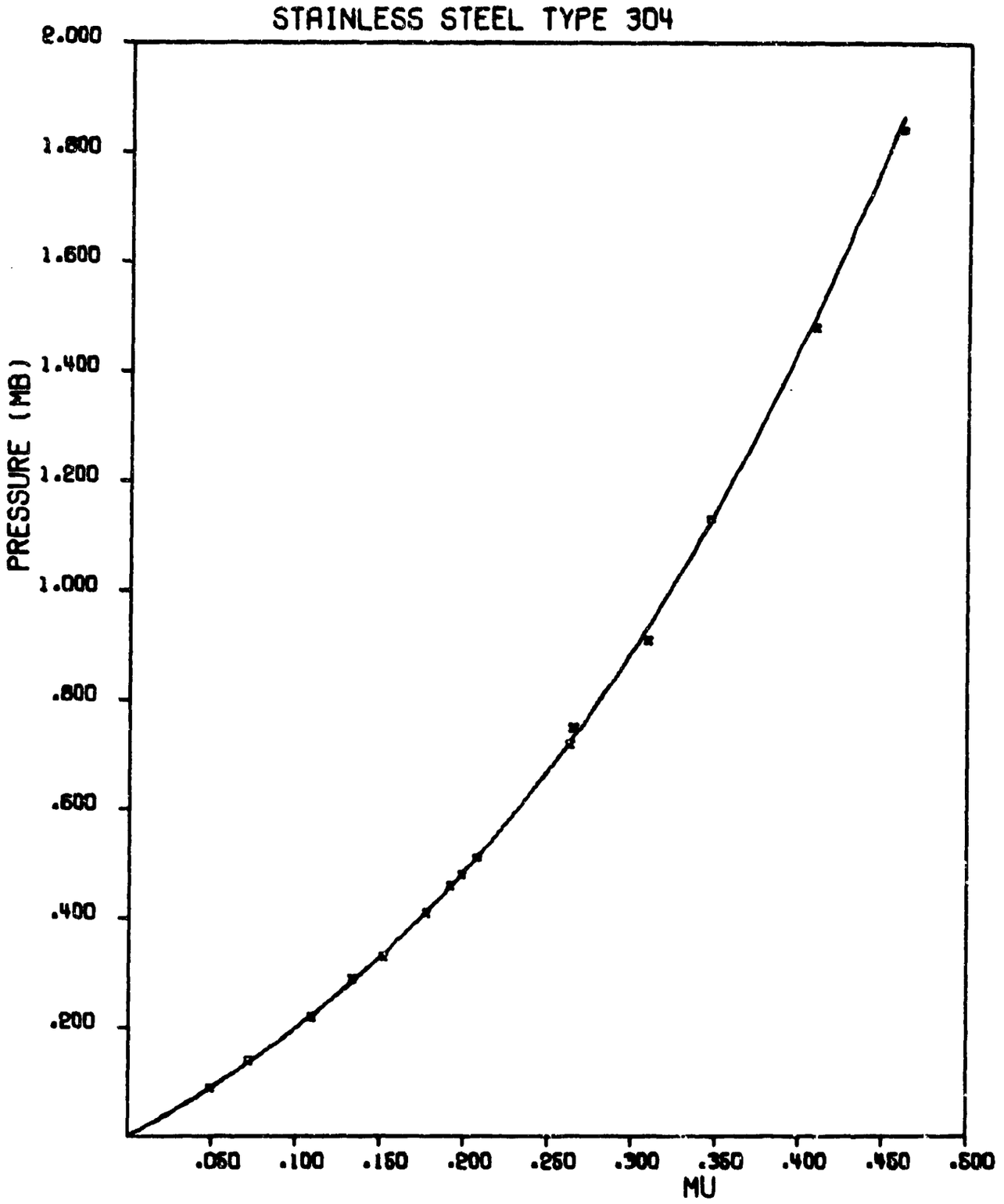
IN THE ELASTIC WAVE C0= 2.66454

IN THE FIRST PLASTIC WAVE C1= 1.63970 * D1= 2.94437 S1= 5.00088

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
9.0000E-02	8.9513E-02	8.8628E-02	1.0493E+00	9.5300E-01	2.3148E-02	V/VO	20
1.4000E-01	1.3567E-01	1.3478E-01	1.0718E+00	9.3300E-01	3.4467E-02	V/VO	20
2.2000E-01	2.2323E-01	2.2235E-01	1.1099E+00	9.0100E-01	5.2520E-02	V/VO	20
2.9000E-01	2.8493E-01	2.8405E-01	1.1338E+00	8.8200E-01	6.5832E-02	V/VO	20
3.3000E-01	3.3592E-01	3.3504E-01	1.1521E+00	8.6800E-01	7.4275E-02	V/VO	20
4.1000E-01	4.1379E-01	4.1291E-01	1.1779E+00	8.4900E-01	8.8548E-02	V/VO	20
4.6000E-01	4.5930E-01	4.5841E-01	1.1919E+00	8.3900E-01	9.6847E-02	V/VO	20
4.8000E-01	4.8333E-01	4.8245E-01	1.1990E+00	8.3400E-01	1.0045E-01	V/VO	20
5.1000E-01	5.1338E-01	5.1250E-01	1.2077E+00	8.2800E-01	1.0540E-01	V/VO	20
7.2000E-01	7.2518E-01	7.2430E-01	1.2626E+00	7.9200E-01	1.3772E-01	V/VO	20
7.5000E-01	7.3194E-01	7.3105E-01	1.2642E+00	7.9100E-01	1.4090E-01	V/VO	20
7.5000E-01	7.3194E-01	7.3105E-01	1.2642E+00	7.9100E-01	1.4090E-01	V/VO	20
9.1000E-01	9.3574E-01	9.3486E-01	1.3089E+00	7.6400E-01	1.6492E-01	V/VO	20
1.1300E+00	1.1271E+00	1.1264E+00	1.3459E+00	7.4300E-01	1.9178E-01	V/VO	20
1.4800E+00	1.5026E+00	1.5017E+00	1.4085E+00	7.1000E-01	2.3315E-01	V/VO	20
1.8400E+00	1.8638E+00	1.8630E+00	1.4599E+00	6.8500E-01	2.7093E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 9.15459E-03(MB)


STAINLESS STEEL TYPE 304
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR STAINLESS STEEL TYPE 304L

RHO(0)= 7.90300

SUBLIMATION ENERGY= -0. *NO DATA

CL= 5.790E-01(CM/MICROSEC)

GRUNEISEN COEF= 1.1699

CS= 3.160E-01(CM/MICROSEC)

AMU= 7.89162E-01(MB)

THERMAL COEF OF EXPANSION(VOL)= 1.492E-04

YO = 7.01326E-03(MB)

SPECIFIC HEAT(CP)= 2.660E+07

YMU= 4.4434HE-03

CB= 4.567E-01(CM/MICROSEC)

HUGONIOT ELASTIC LIMIT = 1.20000E-02(MB)

SLOPE OF US-UP= 1.4865

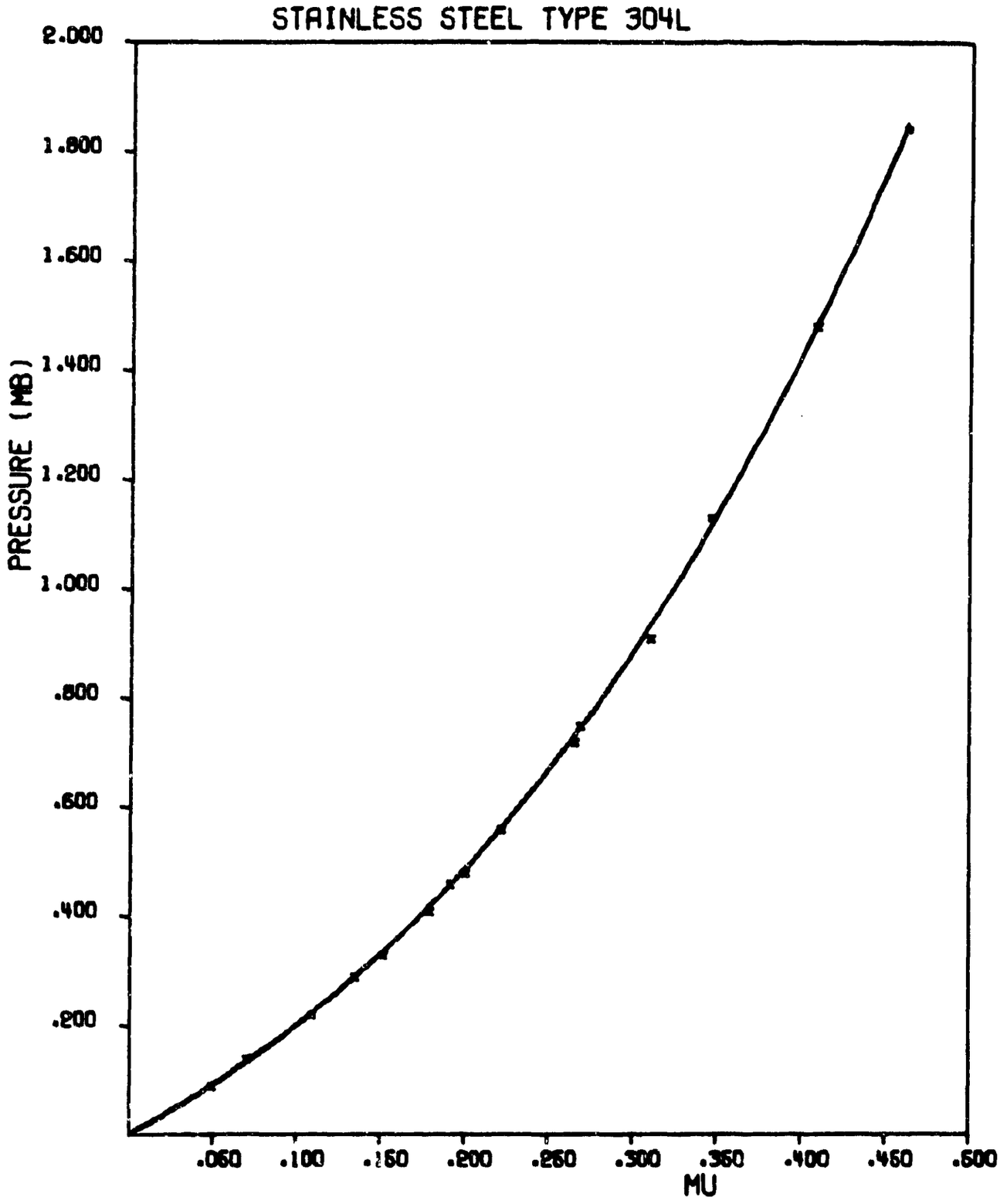
IN THE ELASTIC WAVE C0= 2.70058

IN THE FIRST PLASTIC WAVE C1= 1.64837 * D1= 2.93236 S1= 4.65787

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
9.0000E-02	9.3661E-02	8.8985E-02	1.0493E+00	9.5300E-01	2.3135E-02	V/VO	20
1.4000E-01	1.3744E-01	1.3277E-01	1.0707E+00	9.3400E-01	3.4193E-02	V/VO	20
2.2000E-01	2.2738E-01	2.2270E-01	1.1099E+00	9.0100E-01	5.2497E-02	V/VO	20
2.9000E-01	2.9231E-01	2.8763E-01	1.1351E+00	8.8100E-01	6.6081E-02	V/VO	20
3.3000E-01	3.3955E-01	3.3487E-01	1.1521E+00	8.6800E-01	7.4242E-02	V/VO	20
4.1000E-01	4.2118E-01	4.1650E-01	1.1792E+00	8.4800E-01	8.8801E-02	V/VO	20
4.6000E-01	4.6188E-01	4.5721E-01	1.1919E+00	8.3900E-01	9.6805E-02	V/VO	20
4.8000E-01	4.9053E-01	4.8586E-01	1.2005E+00	8.3300E-01	1.0071E-01	V/VO	20
5.6000E-01	5.6789E-01	5.6322E-01	1.2225E+00	8.1800E-01	1.1356E-01	V/VO	20
7.2000E-01	7.3755E-01	7.3287E-01	1.2658E+00	7.9000E-01	1.3832E-01	V/VO	20
7.5000E-01	7.5109E-01	7.4642E-01	1.2690E+00	7.8800E-01	1.4184E-01	V/VO	20
9.1000E-01	9.3920E-01	9.3452E-01	1.3106E+00	7.6300E-01	1.6520E-01	V/VO	20
1.1300E+00	1.1184E+00	1.1138E+00	1.3459E+00	7.4300E-01	1.9169E-01	V/VO	20
1.4800E+00	1.4846E+00	1.4799E+00	1.4085E+00	7.1000E-01	2.3304E-01	V/VO	20
1.8400E+00	1.8513E+00	1.8467E+00	1.4620E+00	6.8400E-01	2.7124E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 8.81595E-03(MB)


STAINLESS STEEL TYPE 304L
PRESSURE (MB)
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
.060
.100
.160
.200
.260
.300
.360
.400
.460
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR STEEL MILD . EN3

RHO(0)= 7.84000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF=-0. *NO DATA

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 3.630E-05

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 3.596E-01(CM/MICROSEC)

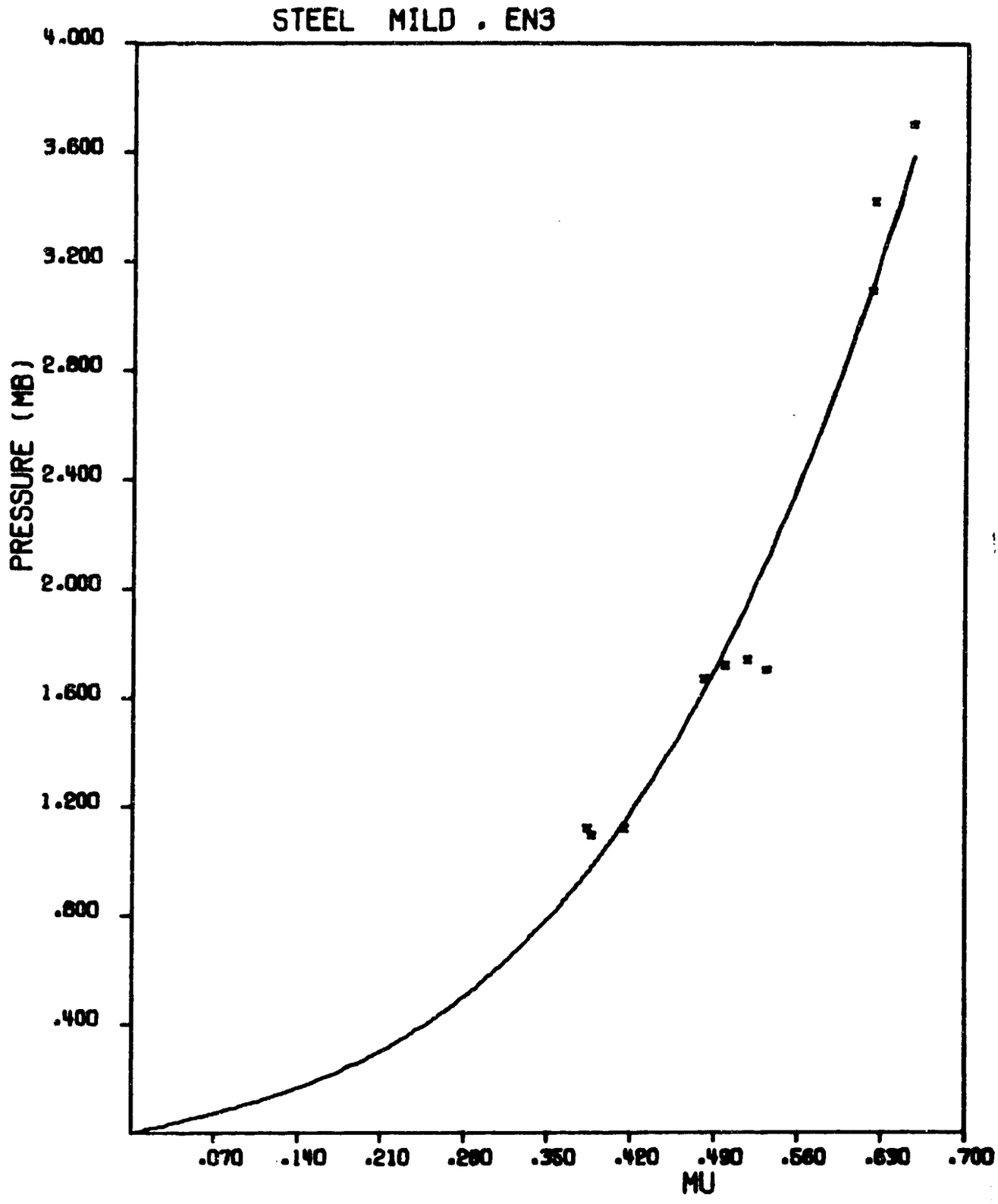
SLOPE OF US-UP= 1.6863

IN THE FIRST PLASTIC WAVE C1= 1.01381 * D1= -.24748 S1= 10.74390

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.0900E+00	9.7779E-01	9.7779E-01	1.3870E+00	7.2100E-01	1.9695E-01	V/VO	11
1.1200E+00	9.5630E-01	9.5630E-01	1.3831E+00	7.2300E-01	1.9893E-01	V/VO	11
1.1200E+00	1.1424E+00	1.1424E+00	1.4144E+00	7.0700E-01	2.0459E-01	V/VO	11
1.6700E+00	1.6300E+00	1.6300E+00	1.4815E+00	6.7500E-01	2.6311E-01	V/VO	11
1.7000E+00	2.1043E+00	2.1043E+00	1.5337E+00	6.5200E-01	2.7470E-01	V/VO	11
1.7200E+00	1.7814E+00	1.7814E+00	1.4993E+00	6.6700E-01	2.7029E-01	V/VO	11
1.7400E+00	1.9469E+00	1.9469E+00	1.5175E+00	6.5900E-01	2.7519E-01	V/VO	11
3.0900E+00	3.1038E+00	3.1038E+00	1.6207E+00	6.1700E-01	3.8853E-01	V/VO	11
3.4200E+00	3.1385E+00	3.1385E+00	1.6234E+00	6.1600E-01	4.0928E-01	V/VO	11
3.7000E+00	3.5862E+00	3.5862E+00	1.6556E+00	6.0400E-01	4.3231E-01	V/VO	11

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.42003E-01(MB)


STEEL MILD . EN3
4.000
3.600
3.200
2.800
2.400
2.000
1.600
1.200
.800
.400
PRESSURE (MB)
.070
.140
.210
.280
.350
.420
.490
.560
.630
.700
MU

CUBIC FIT TO EQUATION OF STATE FOR TANTALUM

RHO(0)= 16.60000

SUBLIMATION ENERGY= 4.28700E+10

GRUNEISEN COEF= .3200

AMU= 7.11293E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 4.150E-01(CM/MICROSEC)

CS= 2.070E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 2.010E-05

SPECIFIC HEAT(CP)= 1.357E+06

CB= 3.300E-01(CM/MICROSEC)

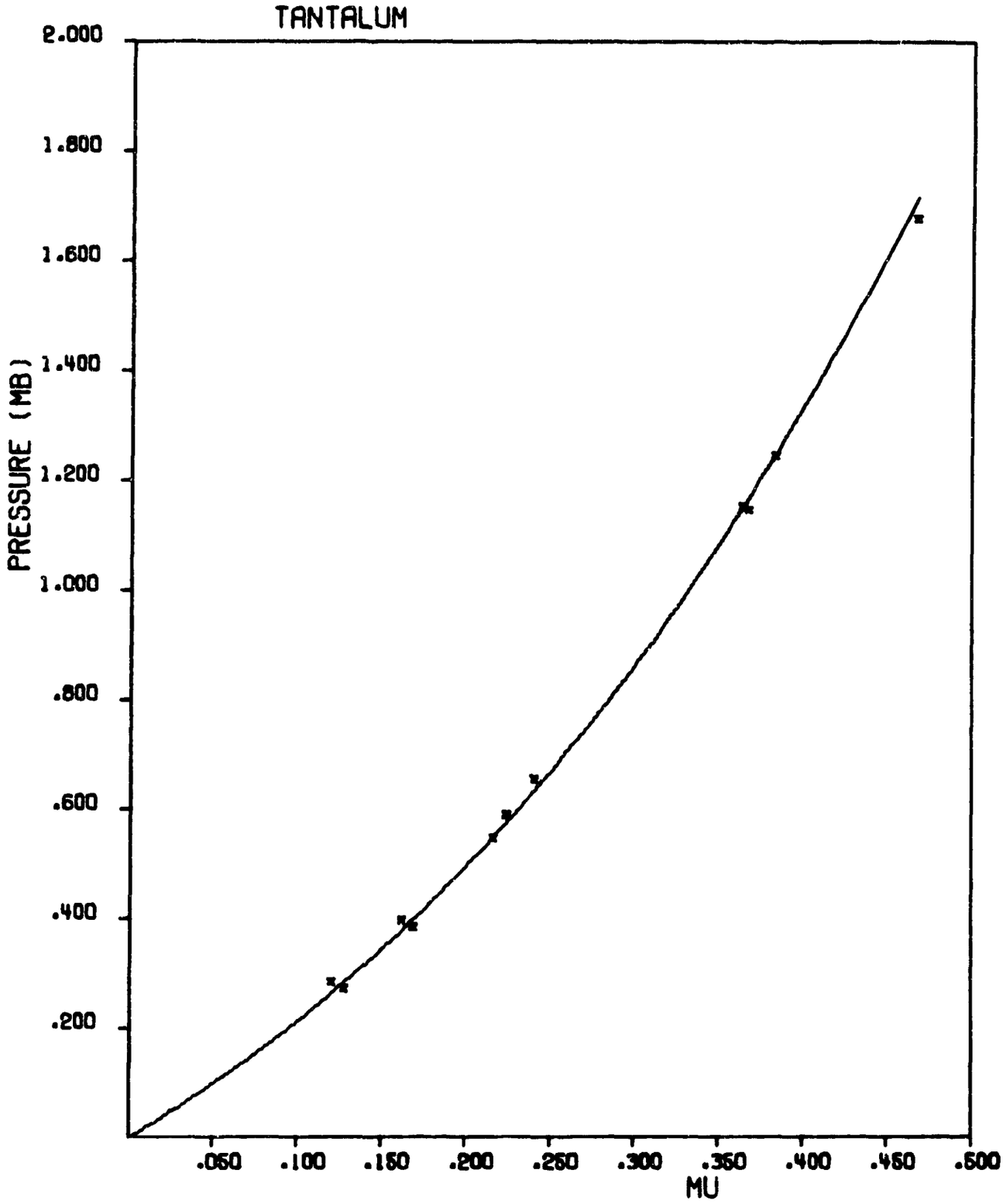
SLOPE OF US-UP= 1.3224

IN THE FIRST PLASTIC WAVE C1= 1.80774 * D1= 2.85902 S1= 2.41927

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.7150E-01	2.8339E-01	2.8339E-01	1.1280E+00	8.8650E-01	4.3085E-02	V/VO	13
2.8450E-01	2.6443E-01	2.6443E-01	1.1208E+00	8.9220E-01	4.2983E-02	V/VO	17
3.8300E-01	3.9897E-01	3.9897E-01	1.1690E+00	8.5540E-01	5.7760E-02	V/VO	13
3.9620E-01	3.7772E-01	3.7772E-01	1.1618E+00	8.6070E-01	5.7661E-02	V/VO	17
5.4700E-01	5.4909E-01	5.4909E-01	1.2162E+00	8.2220E-01	7.6543E-02	V/VO	13
5.4830E-01	5.7503E-01	5.7503E-01	1.2238E+00	8.1710E-01	8.0510E-02	V/VO	17
6.5300E-01	6.3448E-01	6.3448E-01	1.2407E+00	8.0600E-01	8.7358E-02	V/VO	17
1.1450E+00	1.1684E+00	1.1684E+00	1.3671E+00	7.3150E-01	1.3609E-01	V/VO	17
1.1520E+00	1.1520E+00	1.1520E+00	1.3637E+00	7.3330E-01	1.3605E-01	V/VO	17
1.2450E+00	1.2473E+00	1.2473E+00	1.3829E+00	7.2310E-01	1.4411E-01	V/VO	18
1.6763E+00	1.7150E+00	1.7150E+00	1.4671E+00	6.8160E-01	1.7931E-01	V/VO	17

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.49727E-02(MB)


TANTALUM
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR TEFLON

RHO(0)= 2.16000

SUBLIMATION ENERGY= 1.22000E+11

GRUNEISEN COEF= .3900

AMU= 5.40000E-03(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 1.537E-01(CM/MICROSEC)

CS= 5.000E-02(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 6.480E-04

SPECIFIC HEAT(CP)= 3.770E+06

CB= 1.424E-01(CM/MICROSEC)

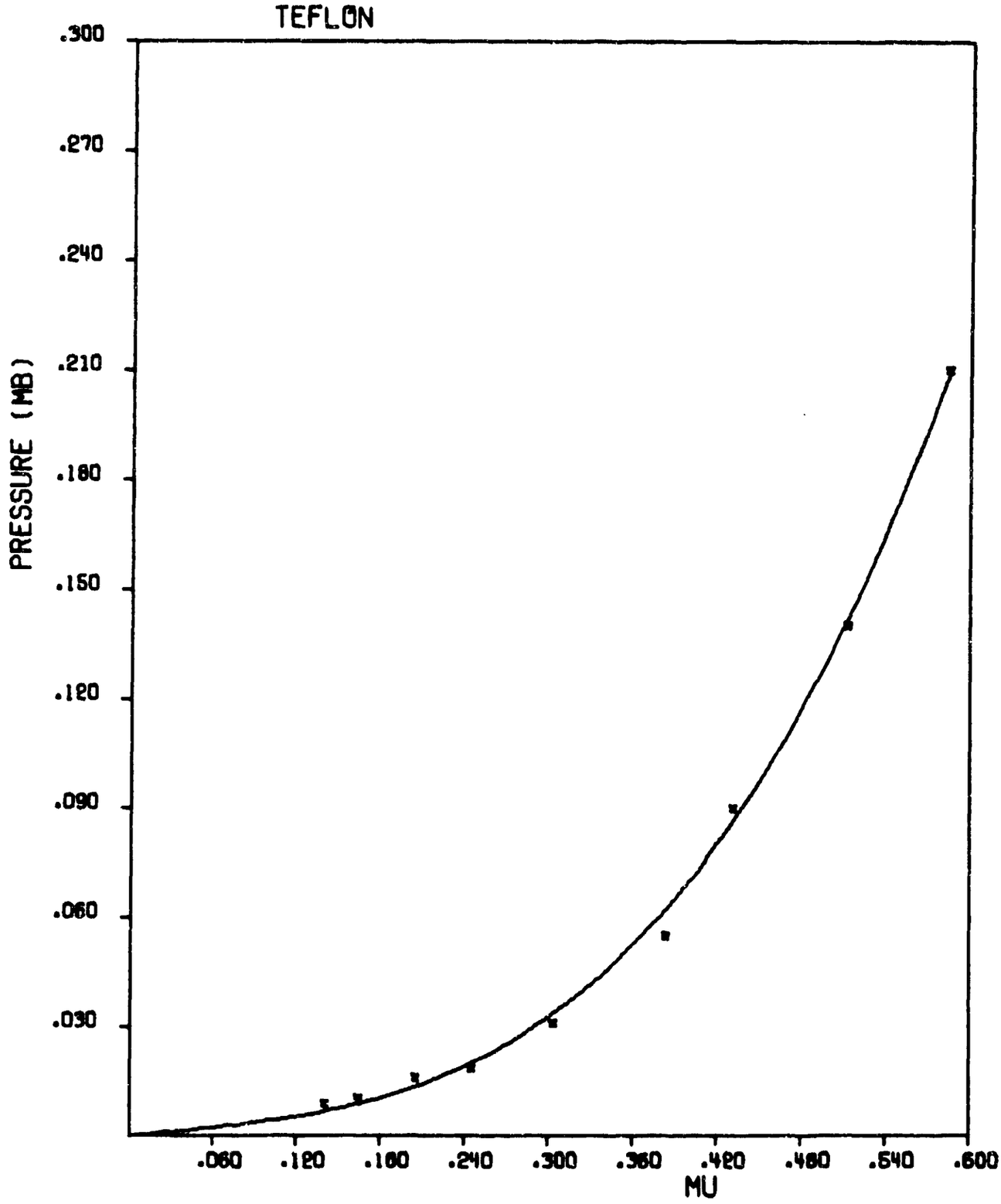
SLOPE OF US-UP= 1.9724

IN THE FIRST PLASTIC WAVE C1= .04380 * D1= -.11955 S1= 1.12266

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
9.0000E-02	8.6336E-02	8.6336E-02	1.4306E+00	6.9900E-01	1.1199E-01	V/VO	20
1.4000E-01	1.4246E-01	1.4246E-01	1.5129E+00	6.6100E-01	1.4823E-01	V/VO	20
2.1000E-01	2.0924E-01	2.0924E-01	1.5848E+00	6.3100E-01	1.8941E-01	V/VO	20
1.0500E-02	8.9336E-03	8.9336E-03	1.1641E+00	8.5900E-01	2.6180E-02	V/VO	19
1.8400E-02	2.0127E-02	2.0127E-02	1.2453E+00	8.0300E-01	4.0965E-02	V/VO	19
3.1100E-02	3.3746E-02	3.3746E-02	1.3038E+00	7.6700E-01	5.7920E-02	V/VO	19
5.4800E-02	6.2369E-02	6.2369E-02	1.3831E+00	7.2300E-01	8.3831E-02	V/VO	19
8.8000E-03	6.9384E-03	6.9384E-03	1.1409E+00	8.7650E-01	2.2431E-02	ETA	25
1.5900E-02	1.3709E-02	1.3709E-02	1.2056E+00	8.2946E-01	3.5431E-02	ETA	25

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 2.71565E-03(MB)


TEFLON
.300
.270
.240
.210
.180
.150
.120
.090
.060
.030
PRESSURE (MB)
.060
.120
.180
.240
.300
.360
.420
.480
.540
.600
MU

CUBIC FIT TO EQUATION OF STATE FOR THALLIUM

RHO(0)= 11.84000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF= 1.5100

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 3.690E-05

SPECIFIC HEAT(CP)= 1.160E+06

CB= 1.887E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.4978

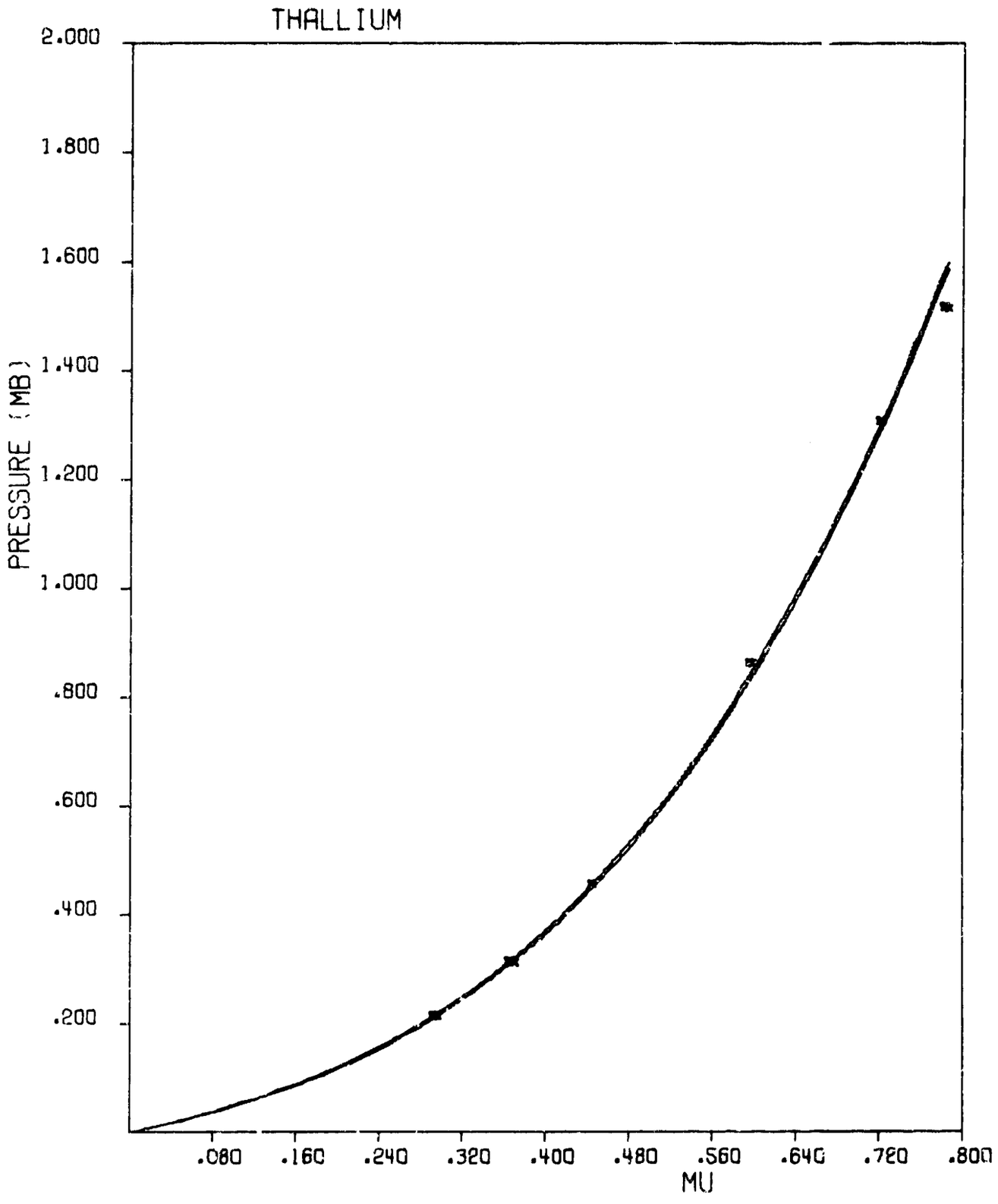
IN THE FIRST PLASTIC WAVE C1= .42160 * D1= .37546 S1= 2.10552

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.1300E-01	2.1825E-01	2.1311E-01	1.2967E+00	7.7120E-01	6.4157E-02	V/VO	19
2.1300E-01	2.1399E-01	2.0891E-01	1.2932E+00	7.7330E-01	6.3862E-02	V/VO	19
3.1200E-01	3.2231E-01	3.1589E-01	1.3712E+00	7.2930E-01	8.4459E-02	V/VO	19
3.1300E-01	3.1232E-01	3.0600E-01	1.3648E+00	7.3270E-01	8.4061E-02	V/VO	19
4.5650E-01	4.5580E-01	4.4809E-01	1.4453E+00	6.9190E-01	1.0899E-01	V/VO	19
4.5650E-01	4.5327E-01	4.4558E-01	1.4440E+00	6.9250E-01	1.0888E-01	V/VO	19
8.6400E-01	8.3726E-01	8.2697E-01	1.5949E+00	6.2700E-01	1.6498E-01	V/VO	19
8.6200E-01	8.4524E-01	8.3490E-01	1.5974E+00	6.2600E-01	1.6501E-01	V/VO	19
1.3060E+00	1.3015E+00	1.2890E+00	1.7212E+00	5.8100E-01	2.1498E-01	V/VO	19
1.5150E+00	1.5979E+00	1.5843E+00	1.7857E+00	5.6000E-01	2.3728E-01	V/VO	19
1.5170E+00	1.5823E+00	1.5688E+00	1.7825E+00	5.6100E-01	2.3716E-01	V/VO	19
1.5160E+00	1.5823E+00	1.5688E+00	1.7825E+00	5.6100E-01	2.3709E-01	V/VO	19

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 2.41145E-02(MB)

YADD AT .2MU = 5.193E-03


THALLIUM
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.080
.160
.240
.320
.400
.480
.560
.640
.720
.800
MU

CUBIC FIT TO EQUATION OF STATE FOR THORIUM

RHO(0)= 11.68000

SUBLIMATION ENERGY= 2.20000E+10 CL= 3.000E-01(CM/MICROSEC)

GRUNEISEN COEF= 1.7600 CS= 1.900E-01(CM/MICROSEC)

AMU= 4.21648E-01(MB) THERMAL COEF OF EXPANSION(VOL)= 3.690E-05

YO = 1.05958E-03(MB) SPECIFIC HEAT(CP)= 1.155E+06

YMU= 1.25648E-03 CB= 2.174E-01(CM/MICROSEC)

HUGONIOT ELASTIC LIMIT = 1.40000E-03(MB) SLOPE OF US-UP= 1.2526

IN THE ELASTIC WAVE C0= 1.11423

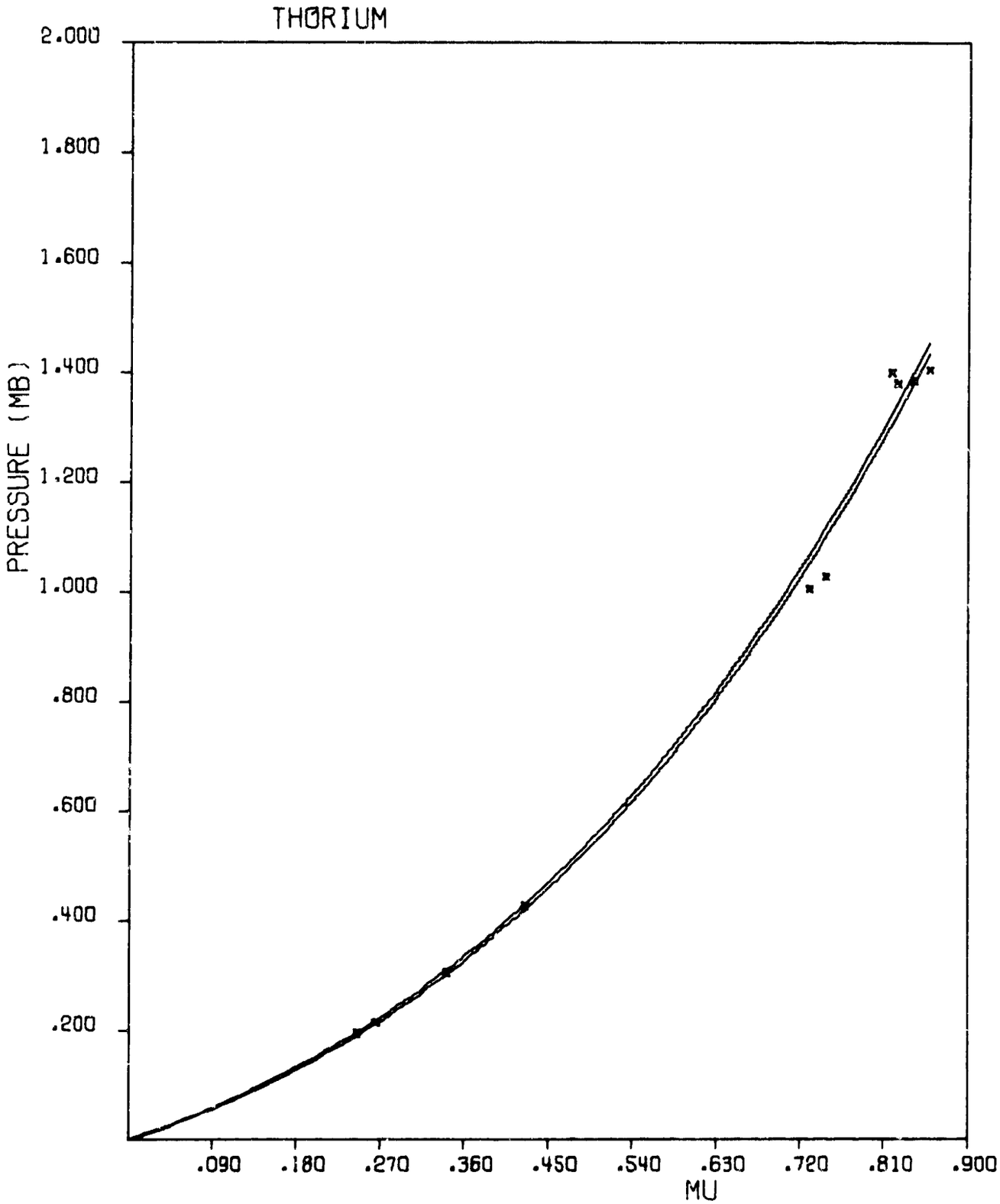
IN THE FIRST PLASTIC WAVE C1= .55203 * D1= .75251 S1= .63833

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.9340E-01	1.9597E-01	1.8999E-01	1.2452E+00	8.0310E-01	5.7099E-02	V/VO	13
2.1390E-01	2.1816E-01	2.1173E-01	1.2657E+00	7.9010E-01	6.2000E-02	V/VO	13
3.0270E-01	3.0937E-01	3.0132E-01	1.3412E+00	7.4560E-01	8.1198E-02	V/VO	13
4.2600E-01	4.2458E-01	4.1971E-01	1.4251E+00	7.0170E-01	1.0431E-01	V/VO	13
1.0030E+00	1.0691E+00	1.0526E+00	1.7301E+00	5.7800E-01	1.9036E-01	V/VO	5
1.0260E+00	1.1187E+00	1.1018E+00	1.7483E+00	5.7200E-01	1.9390E-01	V/VO	5
1.4000E+00	1.3234E+00	1.3050E+00	1.8182E+00	5.5000E-01	2.3225E-01	V/VO	5
1.3780E+00	1.3440E+00	1.3255E+00	1.8248E+00	5.4800E-01	2.3093E-01	V/VO	5
1.3840E+00	1.3970E+00	1.3782E+00	1.8416E+00	5.4300E-01	2.3270E-01	V/VO	5
1.4050E+00	1.4524E+00	1.4332E+00	1.8587E+00	5.3800E-01	2.3574E-01	V/VO	5

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 3.17362E-02(MB)

YADD AT .2MU = 6.446E-03


THORIUM
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.090
.180
.270
.360
.450
.540
.630
.720
.810
.900
MU

CUBIC FIT TO EQUATION OF STATE FOR TIN

RHO(0)= 7.28000

SUBLIMATION ENERGY= 2.48700E+10

GRUNEISEN COEF= 1.8500

AMU= 2.03032E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 3.320E-01(CM/MICROSEC)

CS= 1.670E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 8.070E-05

SPECIFIC HEAT(CP)= 2.270E+06

CB= 2.575E-01(CM/MICROSEC)

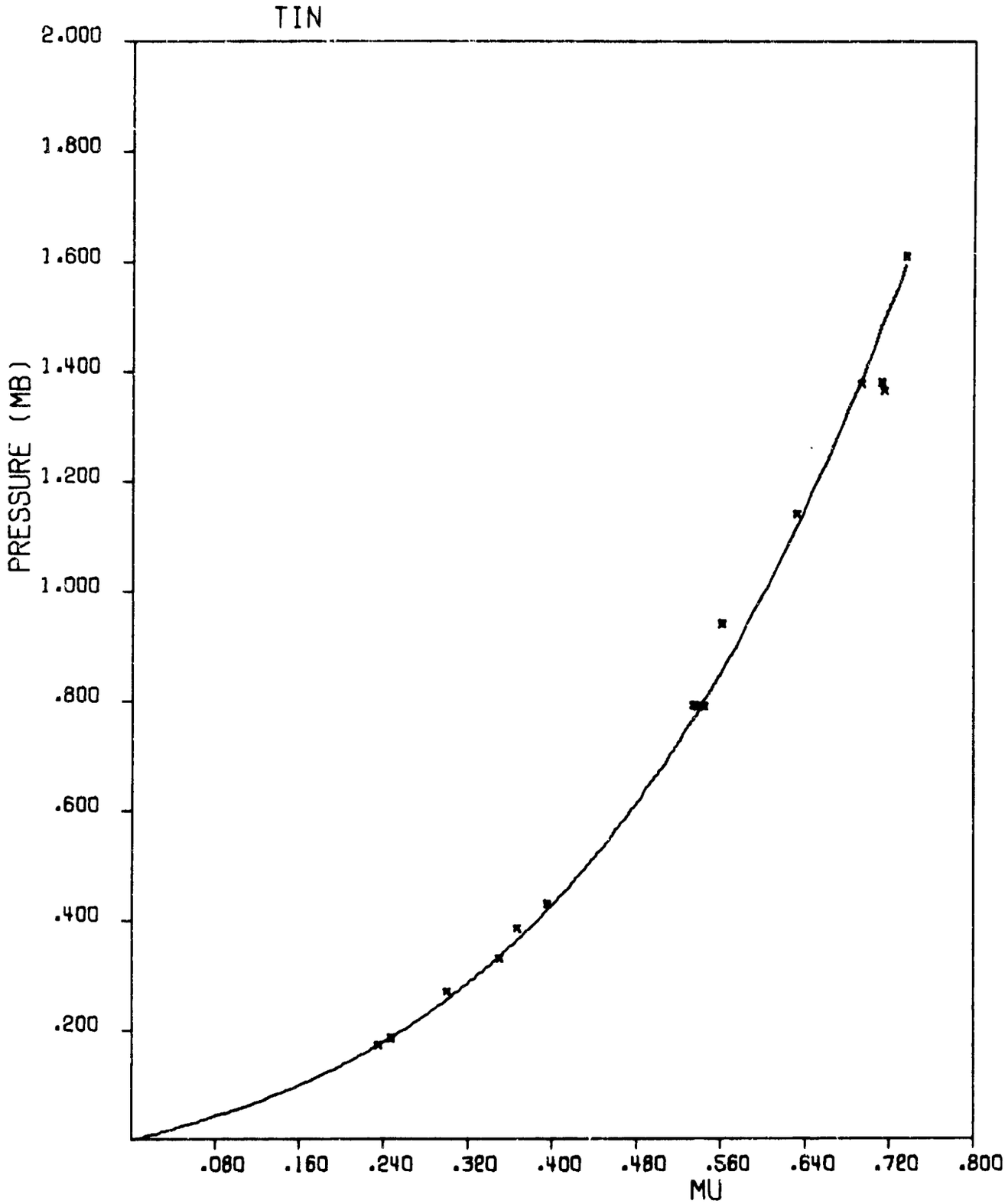
SLOPE OF US-UP= 1.5198

IN THE FIRST PLASTIC WAVE C1= .48271 * D1= .47553 S1= 2.47115

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.7190E-01	1.7163E-01	1.7163E-01	1.2349E+00	8.0980E-01	6.7016E-02	V/VO	13
1.8260E-01	1.8571E-01	1.8571E-01	1.2472E+00	8.0180E-01	7.0508E-02	V/VO	13
2.6960E-01	2.5489E-01	2.5489E-01	1.3004E+00	7.6900E-01	9.2491E-02	V/VO	13
3.3000E-01	3.3328E-01	3.3328E-01	1.3501E+00	7.4070E-01	1.0842E-01	V/VO	14
3.6420E-01	3.6277E-01	3.6277E-01	1.3667E+00	7.3170E-01	1.1899E-01	V/VO	13
4.2780E-01	4.1734E-01	4.1734E-01	1.3951E+00	7.1680E-01	1.2900E-01	V/VO	13
7.8800E-01	7.9863E-01	7.9863E-01	1.5432E+00	6.4800E-01	1.9520E-01	V/VO	5
7.9000E-01	7.7619E-01	7.7619E-01	1.5361E+00	6.5100E-01	1.9461E-01	V/VO	5
7.9200E-01	7.6886E-01	7.6886E-01	1.5337E+00	6.5200E-01	1.9457E-01	V/VO	5
9.3800E-01	8.5362E-01	8.5362E-01	1.5601E+00	6.4100E-01	2.1507E-01	V/VO	14
1.3770E+00	1.3808E+00	1.3808E+00	1.6920E+00	5.9100E-01	2.7814E-01	V/VO	5
1.3780E+00	1.4783E+00	1.4783E+00	1.7123E+00	5.8400E-01	2.8061E-01	V/VO	5
1.3640E+00	1.4928E+00	1.4928E+00	1.7153E+00	5.8300E-01	2.7952E-01	V/VO	5
1.1390E+00	1.1150E+00	1.1150E+00	1.6311E+00	6.1310E-01	2.4603E-01	V/VO	14
1.6080E+00	1.5924E+00	1.5924E+00	1.7349E+00	5.7640E-01	3.0588E-01	V/VO	14

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 3.05197E-02(MB)


TIN
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.080
.160
.240
.320
.400
.480
.560
.640
.720
.800
MU

CUBIC FIT TO EQUATION OF STATE FOR TITANIUM

RHO(0)= 4.51000

SUBLIMATION ENERGY= 9.68300E+10

GRUNEISEN COEF= 2.0400

AMU= 4.40430E-01(MB)

YO = 1.38000E-03(MB)

YMU= 1.56645E-03

HUGONIOT ELASTIC LIMIT = 2.47747E-03(MB)

CL= 6.070E-01(CM/MICROSEC)

CS= 3.125E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 1.400E-05

SPECIFIC HEAT(CP)= 4.709E+06

CB= 4.695E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.1465

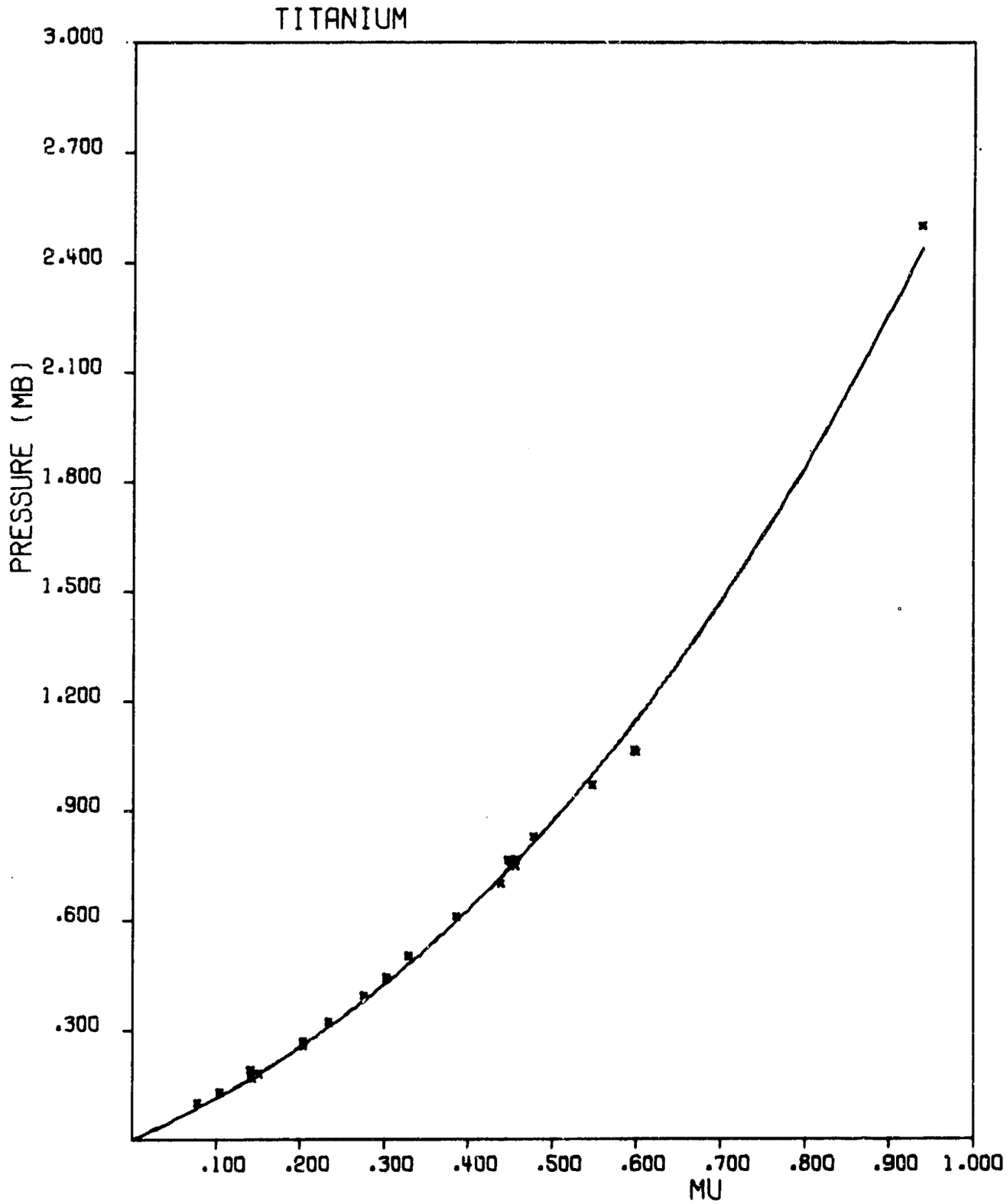
IN THE ELASTIC WAVE C0= 1.58138

IN THE FIRST PLASTIC WAVE C1= .99414 * D1= 1.24432 S1= .48473

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
9.7000E-01	9.9912E-01	9.9820E-01	1.5480E+00	6.4600E-01	2.7593E-01	V/VO	20
7.5000E-01	7.5799E-01	7.5707E-01	1.4556E+00	6.8700E-01	2.2815E-01	V/VO	20
1.0000E-01	8.5768E-02	8.4848E-02	1.0776E+00	9.2800E-01	3.9956E-02	V/VO	20
1.3000E-01	1.1800E-01	1.1708E-01	1.1038E+00	9.0600E-01	5.2053E-02	V/VO	20
1.9000E-01	1.6795E-01	1.6703E-01	1.1416E+00	8.7600E-01	7.2277E-02	V/VO	20
2.7000E-01	2.5864E-01	2.5772E-01	1.2034E+00	8.3100E-01	1.0059E-01	V/VO	20
3.2000E-01	3.0843E-01	3.0791E-01	1.2346E+00	8.1000E-01	1.1611E-01	V/VO	20
4.4000E-01	4.2815E-01	4.2723E-01	1.3021E+00	7.6800E-01	1.5045E-01	V/VO	20
5.0000E-01	4.8149E-01	4.8057E-01	1.3298E+00	7.5200E-01	1.6581E-01	V/VO	20
6.1000E-01	5.9586E-01	5.9494E-01	1.3850E+00	7.2200E-01	1.9391E-01	V/VO	20
7.0000E-01	7.1781E-01	7.1689E-01	1.4388E+00	6.9500E-01	2.1758E-01	V/VO	20
1.6830E-01	1.6993E-01	1.6901E-01	1.1430E+00	8.7490E-01	6.8325E-02	V/VO	13
1.7930E-01	1.8147E-01	1.8055E-01	1.1513E+00	8.6860E-01	7.2277E-02	V/VO	13
2.5570E-01	2.5932E-01	2.5840E-01	1.2038E+00	8.3070E-01	9.7973E-02	V/VO	13
3.9080E-01	3.8046E-01	3.7994E-01	1.2763E+00	7.8350E-01	1.3697E-01	V/VO	13
7.5800E-01	7.4775E-01	7.4683E-01	1.4514E+00	6.8900E-01	2.2863E-01	V/VO	5
7.6200E-01	7.5799E-01	7.5707E-01	1.4556E+00	6.8700E-01	2.2996E-01	V/VO	5
7.6400E-01	7.3765E-01	7.3673E-01	1.4472E+00	6.9100E-01	2.2879E-01	V/VO	5
2.5000E+00	2.4369E+00	2.4360E+00	1.9399E+00	5.1550E-01	5.1824E-01	V/VO	18
1.0630E+00	1.1424E+00	1.1415E+00	1.5974E+00	6.2600E-01	2.9690E-01	V/VO	18
1.0600E+00	1.1501E+00	1.1491E+00	1.6000E+00	6.2500E-01	2.9688E-01	V/VO	18
8.2800E-01	8.1331E-01	8.1239E-01	1.4780E+00	6.7660E-01	2.4367E-01	V/VO	18

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 2.16109E-02(MB)


TITANIUM
3.000
2.700
2.400
2.100
1.800
1.500
1.200
.900
.600
.300
PRESSURE (MB)
.100
.200
.300
.400
.500
.600
.700
.800
.900
1.000
MU

CUBIC FIT TO EQUATION OF STATE FOR TUNGSTEN

RHO(0)= 19.17000

SUBLIMATION ENERGY= 4.51960E+10

GRUNEISEN COEF= 1.4318

AMU= 1.66110E+00(MB)

V0 = 1.98734E-02(MB)

VMU= 6.20617E-03

HUGONIOT ELASTIC LIMIT = 3.20000E-02(MB)

CL= 5.220E-01(CM/MICROSEC)

CS= 2.890E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 1.290E-05

SPECIFIC HEAT(CP)= 1.420E+06

CB= 3.970E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.2954

IN THE ELASTIC WAVE C0= 5.15616

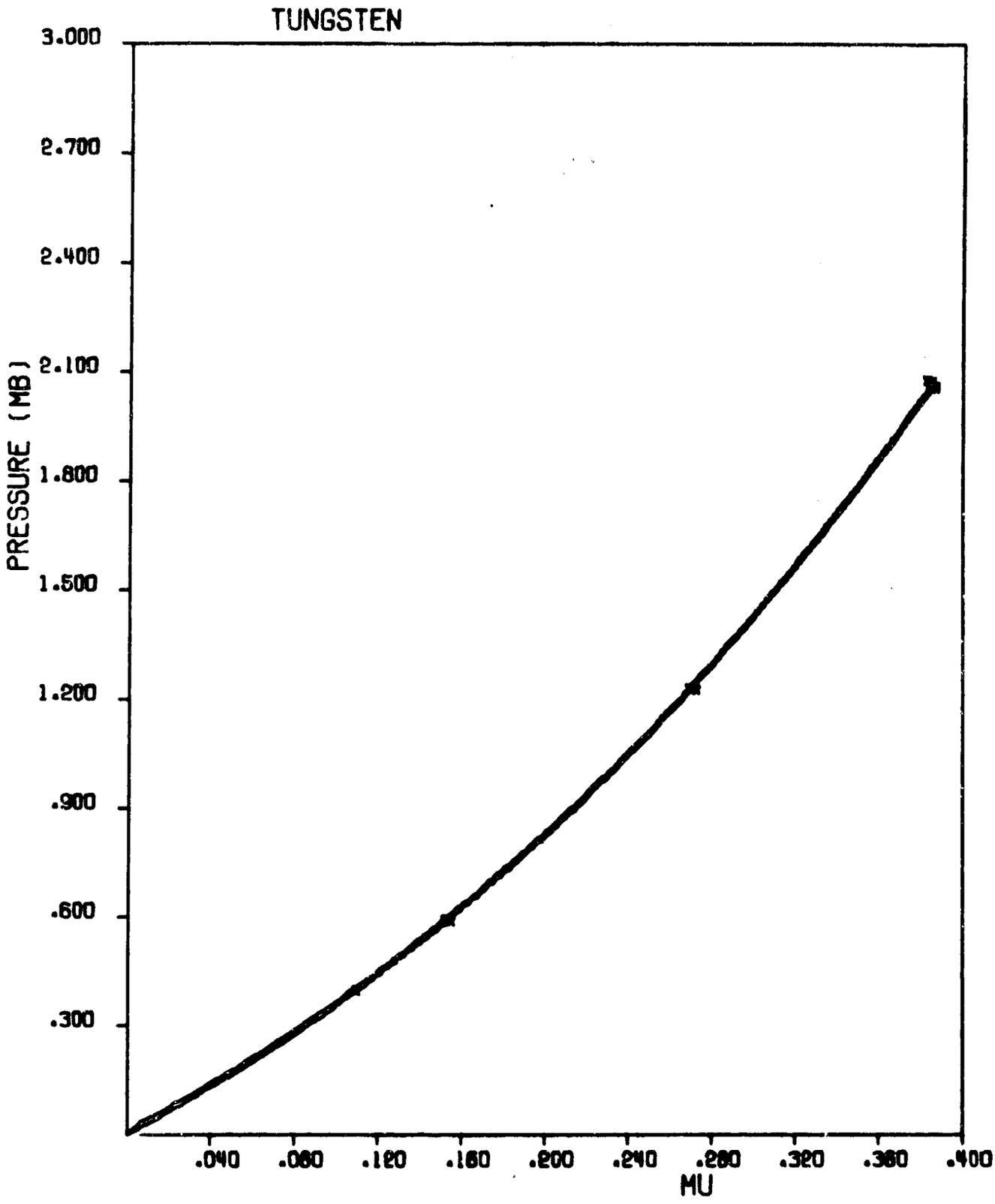
IN THE FIRST PLASTIC WAVE C1= 3.02136 * D1= 4.69886 S1= 3.34996

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/V0	U(CM/MICROSEC)	INPUT	REFERENCE
3.9400E-01	4.0717E-01	3.9316E-01	1.1090E+00	9.0100E-01	4.5108E-02	V/V0	5
3.9500E-01	4.0717E-01	3.9316E-01	1.1090E+00	9.0100E-01	4.5165E-02	V/V0	5
5.8700E-01	6.0677E-01	5.9242E-01	1.1547E+00	8.6600E-01	6.4056E-02	V/V0	5
5.9000E-01	5.9425E-01	5.7992E-01	1.1521E+00	8.6809E-01	6.3739E-02	V/V0	5
1.2250E+00	1.2538E+00	1.2385E+00	1.2723E+00	7.8600E-01	1.1694E-01	V/V0	5
1.2270E+00	1.2334E+00	1.2102E+00	1.2498E+00	7.8800E-01	1.1649E-01	V/V0	5
2.0540E+00	2.0829E+00	2.0669E+00	1.3870E+00	7.2100E-01	1.7290E-01	V/V0	5
2.0610E+00	2.0829E+00	2.0669E+00	1.3870E+00	7.2100E-01	1.7319E-01	V/V0	5
2.0740E+00	2.0517E+00	2.0357E+00	1.3831E+00	7.2300E-01	1.7311E-01	V/V0	5

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 1.63544E-02(MB)

VADD AT .2MU = 2.148E-03


TUNGSTEN
3.000
2.700
2.400
2.100
1.800
1.500
1.200
.900
.600
.300
PRESSURE (MB)
.040
.080
.120
.160
.200
.240
.280
.320
.360
.400
MU

CUBIC FIT TO EQUATION OF STATE FOR TwSP

RHO(0)= 1.66000

SUBLIMATION ENERGY= 1.08840E+11

GRUNEISEN COEF=-0. *NO DATA

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= -0. *NO DATA

SPECIFIC HEAT(CP)= -0. *NO DATA

CB= 3.614E-01(CM/MICROSEC)

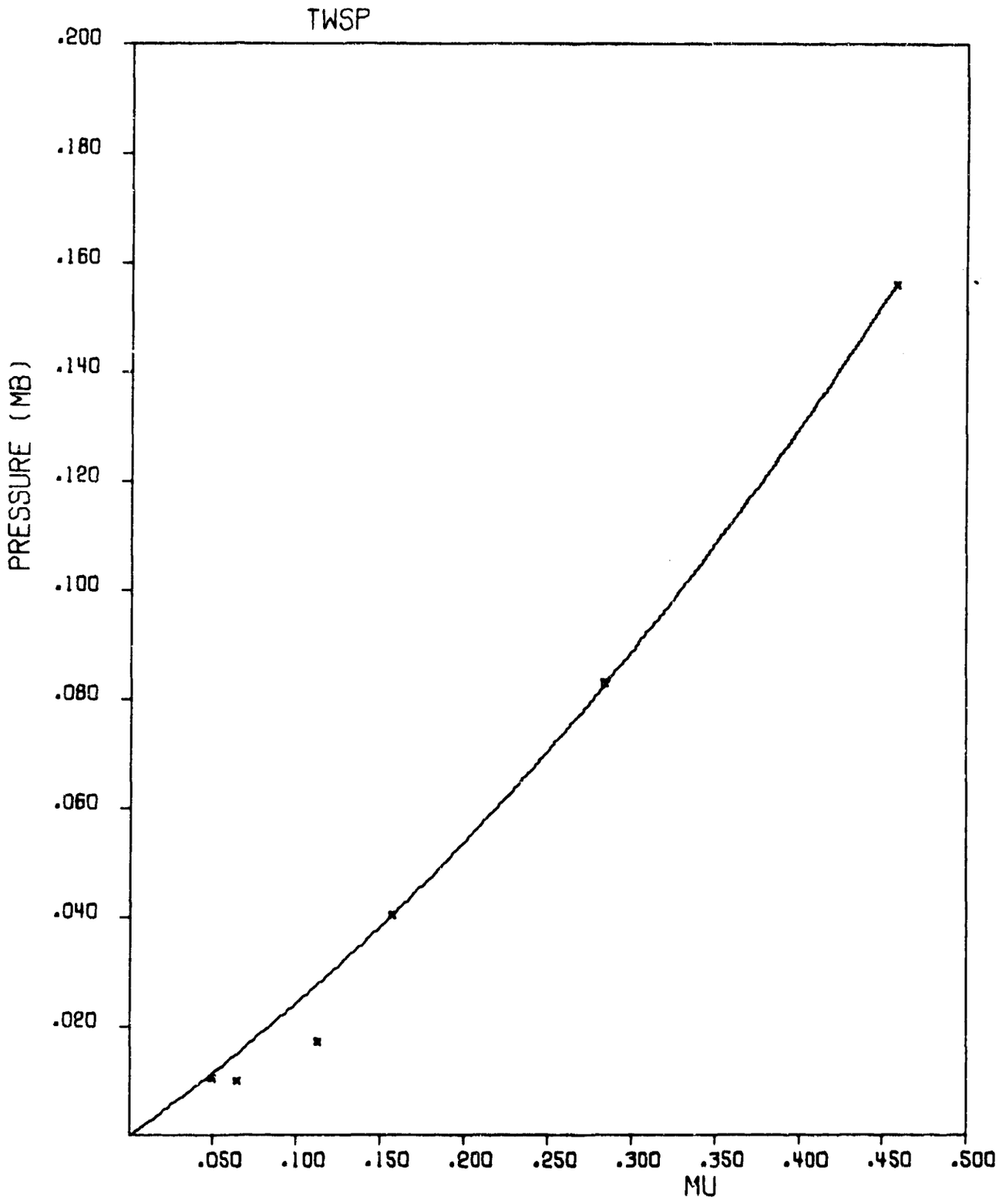
SLOPE OF US-UP= 1.081*

IN THE FIRST PLASTIC WAVE C1= .21681 * D1= .25161 S1= .04298

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.0000E-02	1.5158E-02	1.5168E-02	1.0650E+00	9.3897E-01	1.9175E-02	ETA	1
1.7050E-02	2.7775E-02	2.7775E-02	1.1130E+00	8.9847E-01	3.2292E-02	ETA	1
1.0400E-02	1.1475E-02	1.1475E-02	1.0500E+00	9.5238E-01	1.7272E-02	ETA	1
4.0400E-02	4.0408E-02	4.0408E-02	1.1570E+00	8.6430E-01	5.7467E-02	ETA	23
8.2800E-02	8.2483E-02	8.2483E-02	1.2830E+00	7.7942E-01	1.0489E-01	ETA	23
1.5600E-01	1.5621E-01	1.5621E-01	1.4580E+00	6.8587E-01	1.7182E-01	ETA	23

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 2.91671E-03(MB)


TWSP
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
PRESSURE (MB)
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR URANIUM-3 WT PCT MOLYBDENUM

RHO(0)= 18.45000

SUBLIMATION ENERGY= -0. *NO DATA

GRUNEISEN COEF= 2.0300

AMU= 6.31451E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 3.310E-01(CM/MICROSEC)

CS= 1.850E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 3.840E-05

SPECIFIC HEAT(CP)= 5.065E+06

CH= 2.553E-01(CM/MICROSEC)

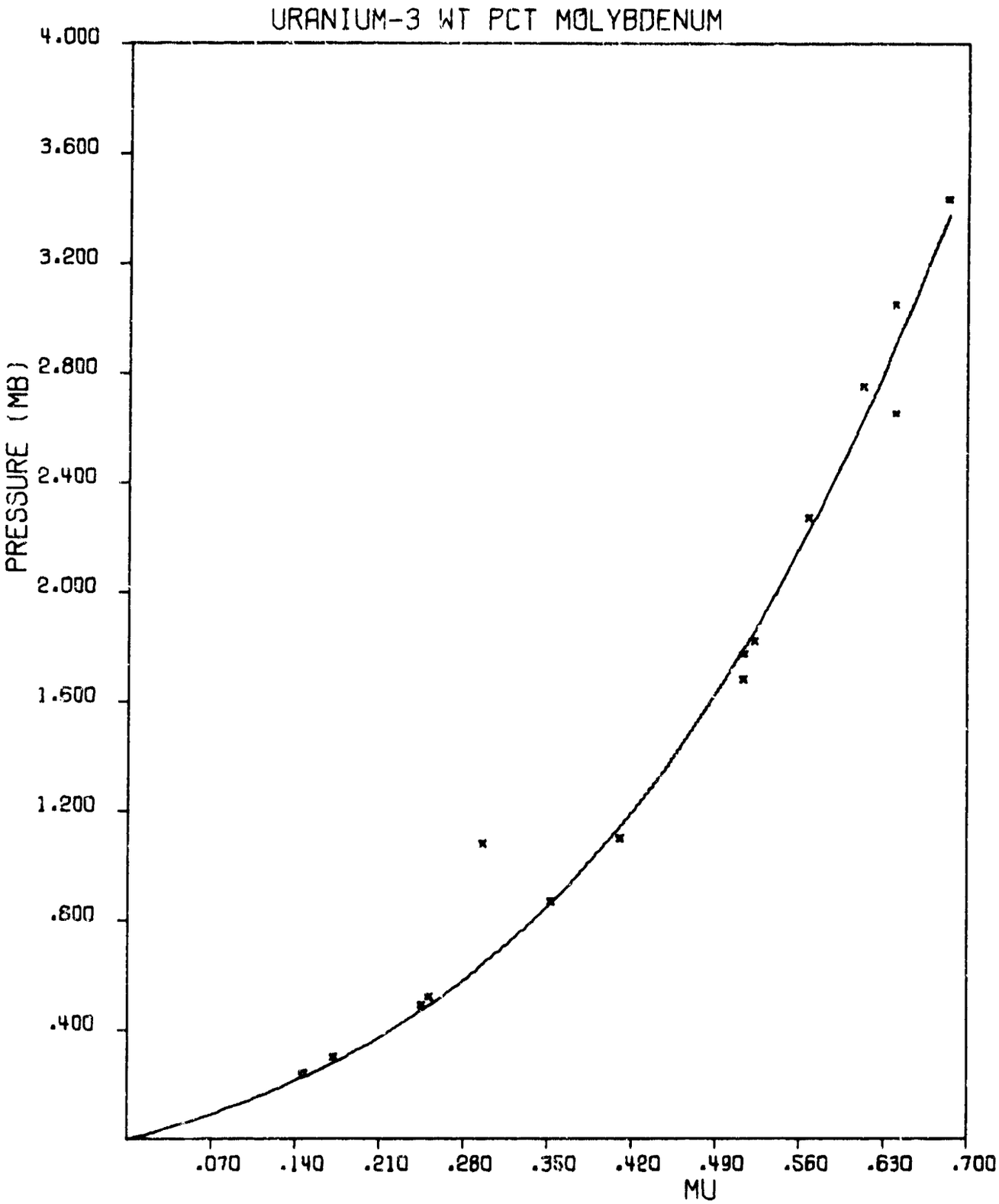
SLOPE OF US-UP= 1.5322

IN THE FIRST PLASTIC WAVE C1= 1.20254 * D1= 1.45929 S1= 5.84026

S(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
2.4000E-01	2.2643E-01	1.1468E+00	8.7200E-01	4.0805E-02	V/VO	20
3.0000E-01	2.8047E-01	1.1723E+00	8.5300E-01	4.8890E-02	V/VO	20
4.2000E-01	4.0403E-01	1.2453E+00	8.0300E-01	7.2332E-02	V/VO	20
5.2000E-01	4.8784E-01	1.2516E+00	7.9900E-01	7.5266E-02	V/VO	20
1.0800E+00	9.3591E-01	1.3532E+00	7.3900E-01	1.1094E-01	V/VO	20
1.1000E+00	1.1432E+00	1.2962E+00	7.7150E-01	1.1565E-01	V/VO	20
1.6800E+00	1.7884E+00	1.4104E+00	7.0900E-01	1.3172E-01	V/VO	20
1.7700E+00	1.7884E+00	1.5129E+00	6.6100E-01	1.7569E-01	V/VO	20
1.8200E+00	1.8566E+00	1.5129E+00	6.6100E-01	1.8034E-01	V/VO	20
2.2700E+00	2.2190E+00	1.5221E+00	6.5700E-01	1.8394E-01	V/VO	20
2.6500E+00	2.6914E+00	1.5674E+00	6.3800E-01	2.1104E-01	V/VO	20
2.7500E+00	2.8299E+00	1.6393E+00	6.1000E-01	2.3668E-01	V/VO	20
3.0500E+00	3.1916E+00	1.6129E+00	6.2000E-01	2.3799E-01	V/VO	20
3.4300E+00	3.5886E+00	1.6393E+00	6.1000E-01	2.5391E-01	V/VO	20
		1.6835E+00	5.9400E-01	2.7473E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 9.16939E-02(MB)


URANIUM-3 WT PCT MOLYBDENUM
PRESSURE (MB)
4.000
3.600
3.200
2.800
2.400
2.000
1.600
1.200
.800
.400
.070
.140
.210
.280
.350
.420
.490
.560
.630
.700
MU

CUBIC FIT TO EQUATION OF STATE FOR VANADIUM

RHO(0)= 6.1000

SUBLIMATION ENERGY= 9.43000E+10

GRUNEISEN COEF= 2.1100

AMU= 0. (MB) *NO DATA

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= -0. (CM/MICROSEC) *NO DATA

CS= -0. (CM/MICROSEC) *NO DATA

THERMAL COEF OF EXPANSION(VOL)= 2.490E-05

SPECIFIC HEAT(CP)= 2.470E+06

CB= 5.072E-01(CM/MICROSEC)

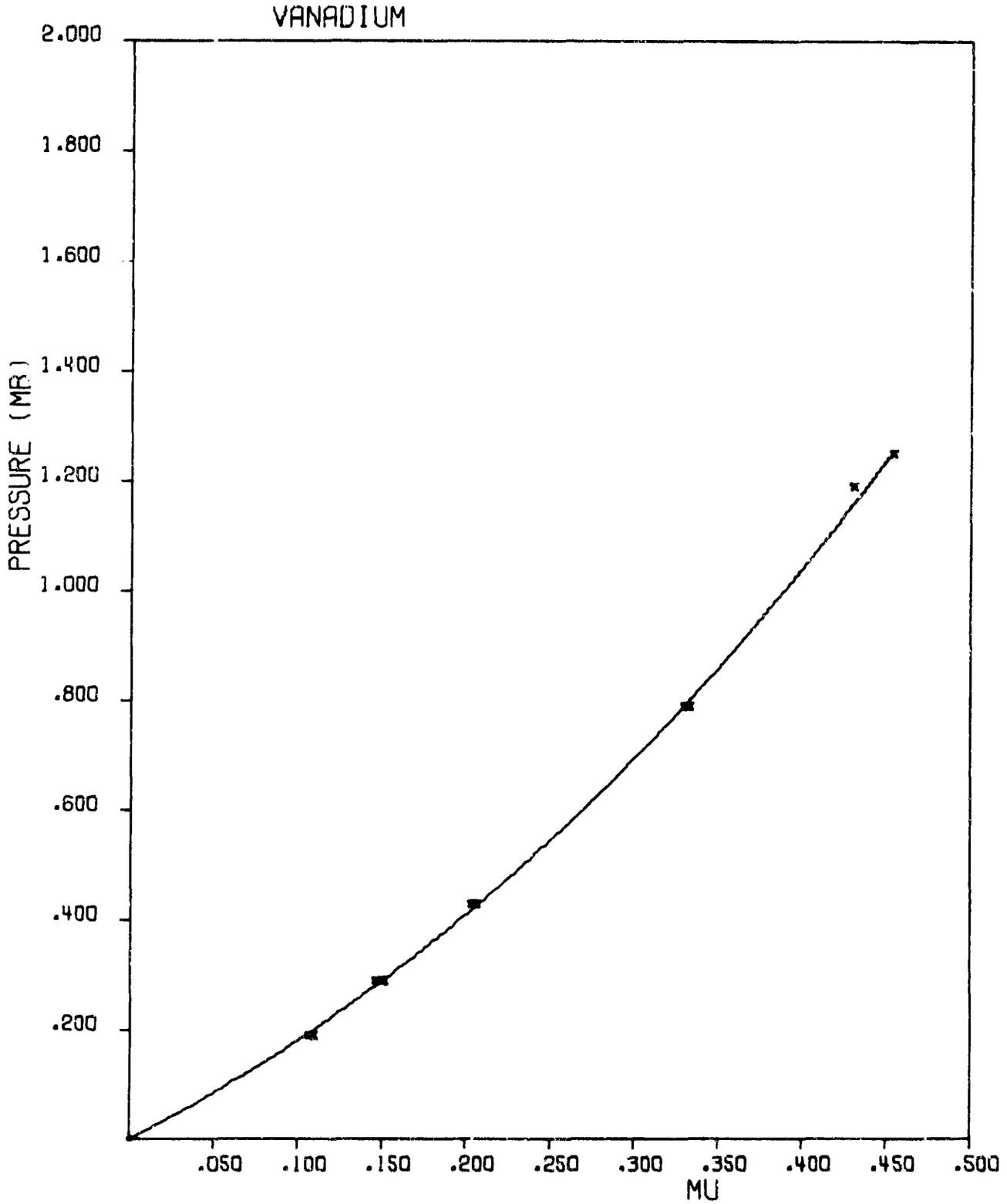
SLOPE OF US-UP= 1.2026

IN THE FIRST PLASTIC WAVE C1= 1.56924 * D1= 2.17686 S1= 1.01261

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
0.	0.	0.	1.0000E+00	1.0000E+00	0.	V/VO	20
1.9000E-01	1.9494E-01	1.9494E-01	1.1074E+00	9.0300E-01	5.4966E-02	V/VO	20
1.9000E-01	2.0005E-01	2.0005E-01	1.1099E+00	9.0100E-01	5.5530E-02	V/VO	20
2.9000E-01	2.8045E-01	2.8045E-01	1.1868E+00	8.4200E-01	7.8008E-02	V/VO	20
2.9000E-01	2.8950E-01	2.8950E-01	1.1507E+00	8.6900E-01	7.8917E-02	V/VO	20
2.9000E-01	2.8950E-01	2.8950E-01	1.1507E+00	8.6[illegible]-01	7.8917E-02	V/VO	20
2.9000E-01	2.8950E-01	2.8950E-01	1.1507E+00	8.6[illegible]-01	7.8917E-02	V/VO	20
2.9000E-01	2.9254E-01	2.9254E-01	1.1521E+00	8.6[illegible]-01	7.9217E-02	V/VO	20
4.3000E-01	4.1768E-01	4.1768E-01	1.2034E+00	8.3100E-01	1.0915E-01	V/VO	20
4.3000E-01	4.2143E-01	4.2143E-01	1.2048E+00	8.3000E-01	1.0947E-01	V/VO	20
4.3000E-01	4.2520E-01	4.2520E-01	1.2063E+00	8.2900E-01	1.0979E-01	V/VO	20
7.9000E-01	7.9059E-01	7.9059E-01	1.3298E+00	7.5200E-01	1.7922E-01	V/VO	20
7.9000E-01	7.9650E-01	7.9650E-01	1.3316E+00	7.5100E-01	1.7958E-01	V/VO	20
7.9000E-01	8.0246E-01	8.0246E-01	1.3333E+00	7.5000E-01	1.7994E-01	V/VO	20
7.9000E-01	8.0246E-01	8.0246E-01	1.3333E+00	7.5000E-01	1.7994E-01	V/VO	20
1.1900E+00	1.1602E+00	1.1602E+00	1.4306E+00	6.9900E-01	2.4232E-01	V/VO	20
1.2500E+00	1.2537E+00	1.2537E+00	1.4535E+00	6.8800E-01	2.5285E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 7.04539E-03(MB)


VANADIUM
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MR)
.050
.100
.150
.200
.250
.300
.350
.400
.450
.500
MU

CUBIC FIT TO EQUATION OF STATE FOR ZINC

RHO(0)= 7.14000

SUBLIMATION ENERGY= 1.90100E+10

GRUNEISEN COEF= 2.1500

AMU= 4.25087E-01(MB)

YO = 1.50000E-03(MB)

YMU= 1.76434E-03

HUGONIOT ELASTIC LIMIT = 2.17264E-03(MB)

CL= 4.210E-01(CM/MICROSEC)

CS= 2.440E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 7.884E-05

SPECIFIC HEAT(CP)= 3.870E+06

CB= 3.051E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.5545

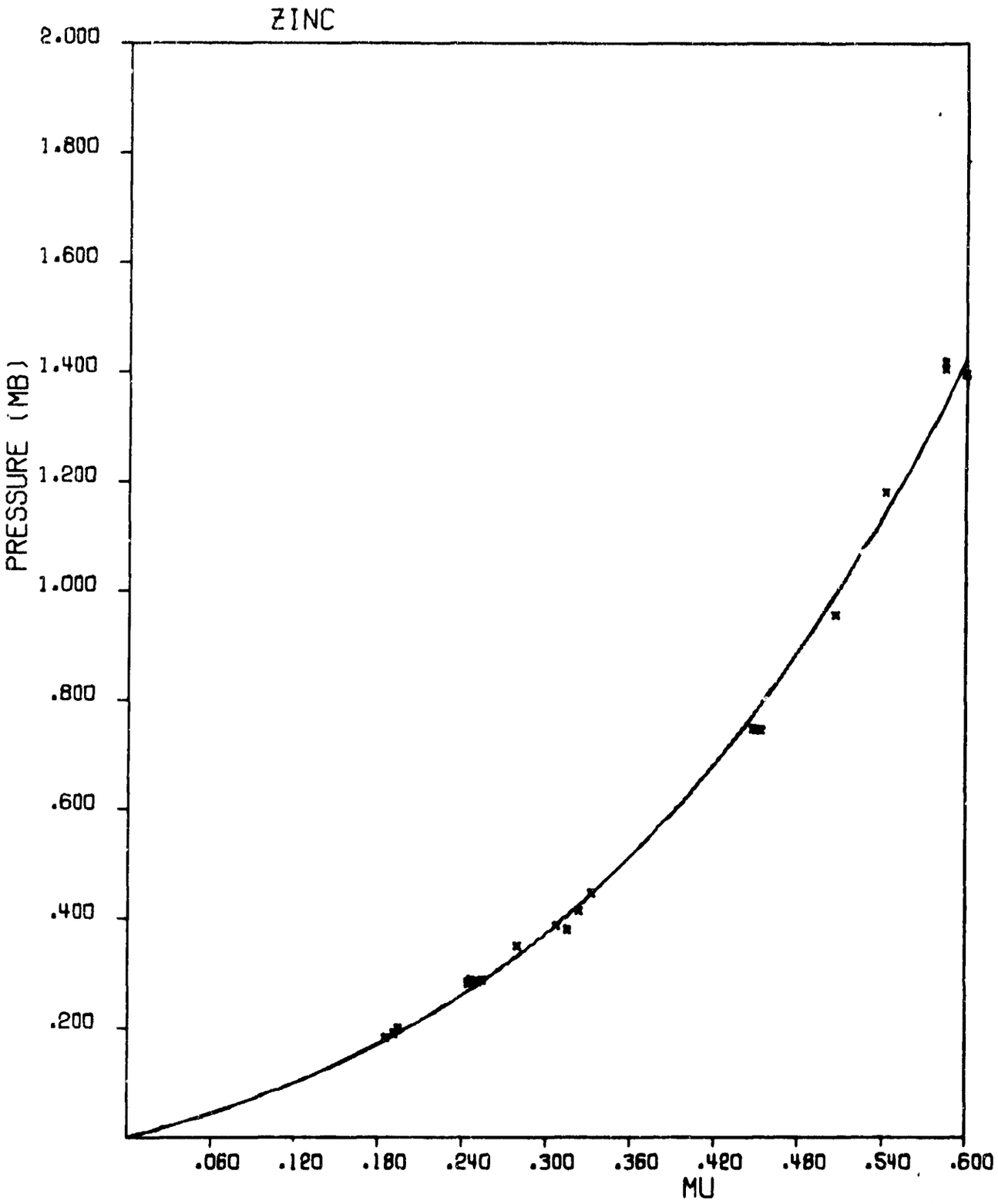
IN THE ELASTIC WAVE C0= 1.23142

IN THE FIRST PLASTIC WAVE C1= .66463 * D1= .99143 S1= 3.07582

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.8100E-01	1.7828E-01	1.7728E-01	1.1857E+00	8.4340E-01	6.3007E-02	V/VO	13
1.8800E-01	1.8561E-01	1.8461E-01	1.1910E+00	8.3960E-01	6.4988E-02	V/VO	13
1.9800E-01	1.9075E-01	1.8975E-01	1.1947E+00	8.3700E-01	6.7232E-02	V/VO	13
2.8100E-01	2.6756E-01	2.6656E-01	1.2444E+00	8.0360E-01	8.7917E-02	V/VO	13
2.8400E-01	2.7963E-01	2.7863E-01	1.2514E+00	7.9910E-01	8.9392E-02	V/VO	13
2.8600E-01	2.7130E-01	2.7080E-01	1.2469E+00	8.0200E-01	8.9057E-02	V/VO	4
2.8700E-01	2.8543E-01	2.8443E-01	1.2547E+00	7.9700E-01	9.0332E-02	V/VO	4
3.5000E-01	3.3219E-01	3.3119E-01	1.2799E+00	7.8130E-01	1.0354E-01	V/VO	14
3.7800E-01	4.0661E-01	4.0561E-01	1.3158E+00	7.6000E-01	1.1272E-01	V/VO	4
3.8700E-01	3.8789E-01	3.8689E-01	1.3072E+00	7.6500E-01	1.1286E-01	V/VO	4
4.1400E-01	4.2379E-01	4.2279E-01	1.3235E+00	7.5560E-01	1.1904E-01	V/VO	13
4.4700E-01	4.4371E-01	4.4271E-01	1.3321E+00	7.5070E-01	1.2493E-01	V/VO	13
7.4300E-01	7.4315E-01	7.9215E-01	1.4535E+00	6.8800E-01	1.8019E-01	V/VO	5
7.4500E-01	7.7465E-01	7.7765E-01	1.4493E+00	6.9000E-01	1.7985E-01	V/VO	5
7.4700E-01	7.7151E-01	7.7051E-01	1.4472E+00	6.9100E-01	1.7940E-01	V/VO	5
9.5400E-01	9.9339E-01	9.9239E-01	1.5069E+00	6.6360E-01	2.1201E-01	V/VO	14
1.1790E+00	1.1465E+00	1.1455E+00	1.5430E+00	6.4810E-01	2.4106E-01	V/VO	14
1.3940E+00	1.4211E+00	1.4201E+00	1.6000E+00	6.2500E-01	2.7058E-01	V/VO	5
1.4030E+00	1.3938E+00	1.3928E+00	1.5848E+00	6.3100E-01	2.6927E-01	V/VO	5
1.4160E+00	1.3938E+00	1.3928E+00	1.5848E+00	6.3100E-01	2.7052E-01	V/VO	5

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 2.22466E-02(MB)


ZINC
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.060
.120
.180
.240
.300
.360
.420
.480
.540
.600
MU

CUBIC FIT TO EQUATION OF STATE FOR ZIRCONIUM

RHO(0)= 6.50500

SUBLIMATION ENERGY= 6.62500E+10

GRUNEISEN COEF= .8700

AMU= 3.71572E-01(MB)

YO =-0. (MB)

YMU= 0.

HUGONIOT ELASTIC LIMIT =-0. (MB)

CL= 4.770E-01(CM/MICROSEC)

CS= 2.390E-01(CM/MICROSEC)

THERMAL COEF OF EXPANSION(VOL)= 5.780E-06

SPECIFIC HEAT(CP)= 2.562E+06

CB= 3.757E-01(CM/MICROSEC)

SLOPE OF US-UP= 1.0180

IN THE FIRST PLASTIC WAVE C1= .91818 * D1= .95121 S1= .03428

IN THE SECOND PLASTIC WAVE C2= .67109 * D2= 3.56056 S2= -.46068

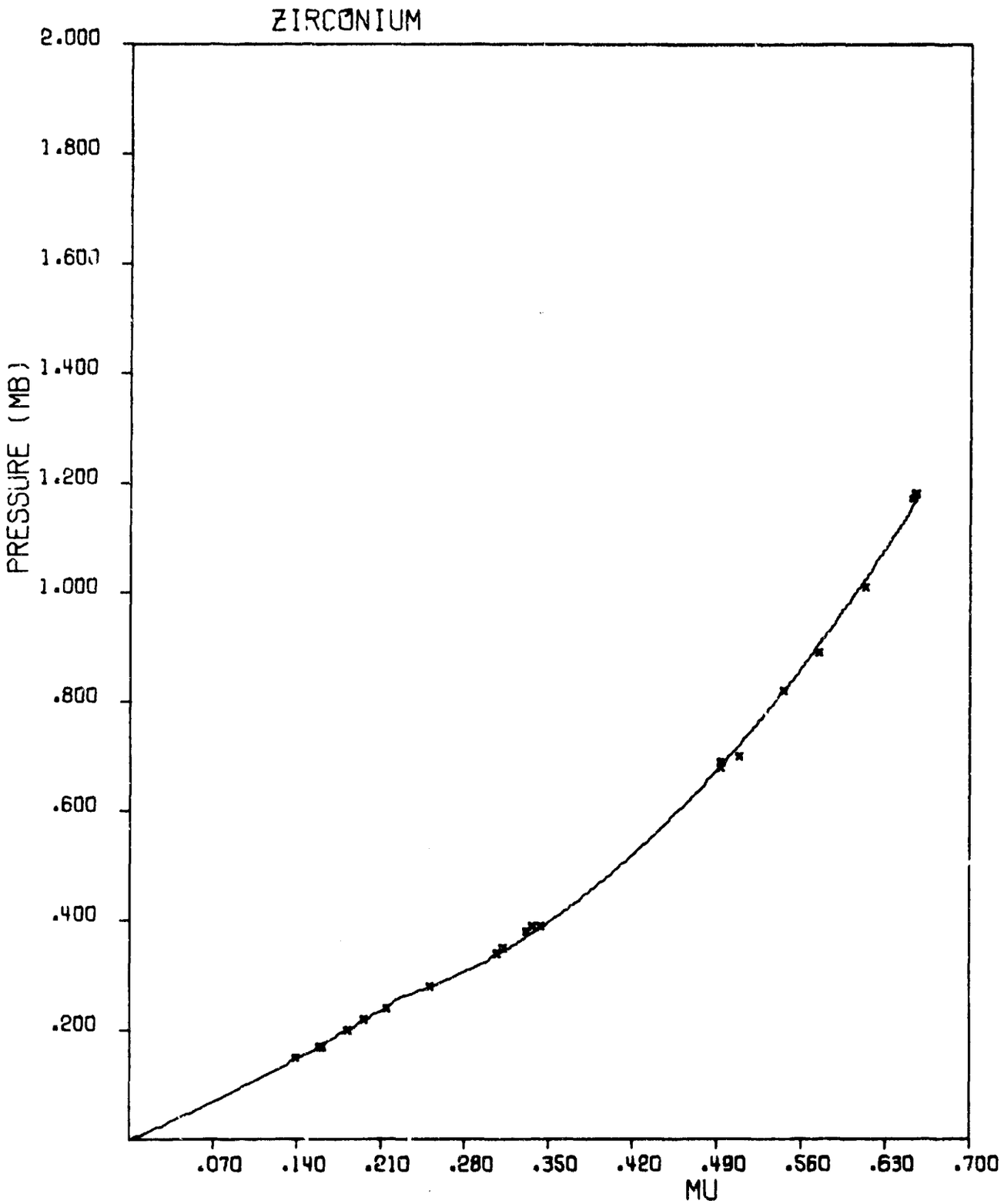
INFLECTION POINT PRESSURE(MB) = 2.60000E-01 MU = .22670

CH = .2900 SLOPE = -0. RHO = 7.9797

S(MB)	SCAL(MB)	PCAL(MB)	ETA	V/VO	U(CM/MICROSEC)	INPUT	REFERENCE
1.5000E-01	1.4604E-01	1.4604E-01	1.1390E+00	8.7800E-01	5.3040E-02	V/VO	20
1.7000E-01	1.6987E-01	1.6987E-01	1.1587E+00	8.6300E-01	5.9836E-02	V/VO	20
1.7000E-01	1.7317E-01	1.7317E-01	1.1614E+00	8.6100E-01	6.0271E-02	V/VO	20
2.0000E-01	1.9887E-01	1.9887E-01	1.1820E+00	8.4600E-01	6.8810E-02	V/VO	20
2.2000E-01	2.1699E-01	2.1699E-01	1.1962E+00	8.3600E-01	7.4475E-02	V/VO	20
2.2000E-01	2.1699E-01	2.1699E-01	1.1962E+00	8.3600E-01	7.4475E-02	V/VO	20
2.4000E-01	2.4181E-01	2.4181E-01	1.2151E+00	8.2300E-01	8.0811E-02	V/VO	20
2.4000E-01	2.4181E-01	2.4181E-01	1.2151E+00	8.2300E-01	8.0811E-02	V/VO	20
2.8000E-01	2.7888E-01	2.7888E-01	1.2516E+00	7.9900E-01	9.3015E-02	V/VO	20
3.4000E-01	3.3684E-01	3.3684E-01	1.3072E+00	7.6500E-01	1.1083E-01	V/VO	20
3.5000E-01	3.4329E-01	3.4329E-01	1.3123E+00	7.6200E-01	1.1316E-01	V/VO	20
3.8000E-01	3.6899E-01	3.6899E-01	1.3316E+00	7.5100E-01	1.2061E-01	V/VO	20
3.9000E-01	3.7657E-01	3.7657E-01	1.3369E+00	7.4800E-01	1.2292E-01	V/VO	20
3.9000E-01	3.8709E-01	3.8709E-01	1.3441E+00	7.4400E-01	1.2389E-01	V/VO	20
6.8000E-01	6.8137E-01	6.8137E-01	1.4925E+00	6.7000E-01	1.8573E-01	V/VO	20
6.9000E-01	6.8137E-01	6.8137E-01	1.4925E+00	6.7000E-01	1.8709E-01	V/VO	20
7.0000E-01	7.2103E-01	7.2103E-01	1.5083E+00	6.6300E-01	1.9043E-01	V/VO	20
8.2000E-01	8.2116E-01	8.2116E-01	1.5456E+00	6.4700E-01	2.1095E-01	V/VO	20
8.9000E-01	9.0563E-01	9.0563E-01	1.5748E+00	6.3500E-01	2.2347E-01	V/VO	20
1.0100E+00	1.0237E+00	1.0237E+00	1.6129E+00	6.2000E-01	2.4290E-01	V/VO	20
1.1700E+00	1.1571E+00	1.1571E+00	1.6529E+00	6.0500E-01	2.6654E-01	V/VO	20
1.1800E+00	1.1666E+00	1.1666E+00	1.6556E+00	6.0400E-01	2.6802E-01	V/VO	20

* IMPLIES LINEAR TERM IS IMPOSED.

AVERAGE DEVIATION FROM SCAL= 6.55573E-03(MB)


ZIRCONIUM
2.000
1.800
1.600
1.400
1.200
1.000
.800
.600
.400
.200
PRESSURE (MB)
.070
.140
.210
.280
.350
.420
.490
.560
.630
.700
MU

SECTION V

MATERIAL DATA REFERENCE SOURCES

Aluminum

E_s	Reference 39
C_L, C_S	Reference 11
C_P, β	Handbook of Physics and Chemistry
Γ	Reference 40
Y_o	Taken from a materials handbook

Aluminum (1060)

C_L, C_S	Reference 46
C_B	Reference 24
C_P, β	Reference 46
Γ	Reference 46
Composition (percent)	Al/Si/Fe/Cu/Mn/Mg/Zn/Ti/99.13/0.25/0.35/0.05/0.03/0.03/0.05/0.03

Aluminum (6061-T6)

C_L, C_S	Reference 46
C_P, β	Reference 46
Γ	Reference 46
Hugoniot Elastic Limit	Reference 20
Composition (percent)	Al/Mg/Si/Cu/Cr/97.9/1.0/0.6/0.25/0.25

24ST Aluminum

C_P, β	Reference 13
Γ	Reference 43

921-T Aluminum

C_L, C_S	Reference 20
C_p, β	Reference 20
Γ	Reference 20

Aluminum (2024)

C_L, C_S	Reference 20
C_p, β	Reference 20
Γ	Reference 20
Hugoniot Elastic Limit	Reference 20
C_B	Reference 20

Antimony

C_p, β	Handbook of Physics and Chemistry
Γ	Calculated from C_p, β
Y_o	Handbook of Physics and Chemistry

*Phase transitions at 115 Kb and 135 Kb not indicated in this report. See Journal of Applied Physics, Vol 39, No. 7, "Dynamic Observations of the Course of a Shock Induced Polymorphic Phase Transition in Antimony."

Avcoat

C_L, C_S	Reference 46
C_p, β	Reference 46
Γ	Calculated from C_p, β

Beryllium

E_s	Reference 39
C_L, C_S	Handbook of Physics and Chemistry
C_p, β	Handbook of Physics and Chemistry
Γ	Calculated from C_p, β
Y_o	Taken from a materials handbook

Bismuth

E_s	Reference 39
C_L, C_S	Reference 39
C_p, β	Reference 13
Γ	Reference 40

*Phase transition not indicated in this report.

Boron Nitride

E_s	Data from McDonnell Douglas Corporation
Γ	Reference 44

Brass

C_L, C_S, C_p, β, Y_o	Handbook of Physics and Chemistry
Γ	Calculated from C_p, β

Cadmium

E_s	Reference 39
C_L, C_S	Reference 13
C_p, β	Reference 40
Γ	Reference 40

Boron Carbide

E_s	Data from McDonnell Douglas Corporation (estimate)
Γ	Reference 48

Silicon Carbide

E_s	Data from McDonnell Douglas Corporation (estimate)
C_L, C_S	Reference 20
Γ	Reference 48

Tungsten Carbide

E_s	Data from McDonnell Douglas Corporation (estimate)
C_L, C_S	Reference 20
Γ	Reference 48

Carbon Phenolic

E_s	Reference 44
C_L, C_S	Reference 46
C_p, β	Reference 46
Γ	Calculated from C_p, β

Chromium

E_s	Reference 39
C_L, C_S	Reference 13
C_p, β	Handbook of Physics and Chemistry
Γ	Reference 20

Cobalt

E_s	Reference 39
C_p, β	Reference 13
Γ	Calculated from C_p, β

Copper

E_s	Reference 39
C_L, C_S	Reference 13
C_p, β	Handbook of Physics and Chemistry
γ	Reference 20
Y_o	Handbook of Physics and Chemistry

Epoxy

C_L, C_S	Reference 20
C_B	Reference 26
β	Reference 48

AVCO Phenolic Fiberglass

C_L	0.435 cm/microsec (a-direction), 0.272 cm/microsec (c-direction) Reference 43
C_p, β	Reference

GE Phenolic Fiberglass

C_L	0.434 cm/microsec (a-direction), 0.333 cm/microsec (c-direction) Reference 43
C_S	Calculated from C_L, C_B (approximate)
C_p, β	Reference 46
Γ	Reference 46

Gold

E_s	Reference 39
C_L, C_S	Reference 46
C_p, β	Reference 40
Γ	Reference 46
Y_o	Taken from a materials handbook

Pyrolytic Graphite

E_s	Estimated for medium to low pressures
C_p	Reference 44
β	Reference 43
Γ	Calculated from C_p, β

*For further data see (1) AFWL-TR-64-42, Reference 36; (2) AFWL-TR-64-92, Vol II, Reference 38; (3) Boeing D2-90099, Reference 29; (4) Journal of Applied Physics, Vol 34, No. 4, 844 (1963), Reference 35

Hafnium

E_s	Reference 39
C_L, C_S	Reference 20
C_p, β	Reference 40
Γ	Reference 40

Iron

E_s	Reference 39
C_L, C_S	Reference 21
C_p, β	Reference 40
Γ	Reference 20
Hugoniot Elastic Limit	Taken from Reference 20 where elastic limit varies from 15 kbar for FINE GRAIN HARD to 9 kbar for LARGE GRAIN SOFT iron

*The low pressure data below the phase transition at 130 kbar is Armco Iron. Material properties indicated for Armco Iron and Iron have been considered the same.

Lead

E_s	Reference 39
C_L, C_S	Reference 13
C_p, β	Reference 40
Γ	Reference 46

Lucite

C_L, C_S	Reference 20

Magnesium

E_s	Reference 39
C_L, C_S	Reference 17
C_p, β	Handbook of Physics and Chemistry

Magnesium (cont'd)	
Y_o	Handbook of Physics and Chemistry
Γ	Reference 40
Manganin	
C_p, β	Reference 22
Γ	Calculated from C_p, β
Composition (percent)	Cu/Mn/Ni/84/12/4
Molybdenum	
E_s	Reference 39
C_p, β	Reference 40
Γ	Reference 40
Mylar	For additional data see References 29 and 23
Nickel	
E_s	Reference 39
C_L, C_S	Reference 13
Niobium	
E_s	Reference 39
C_L, C_S	Reference 20
C_p, β	Reference 40
Γ	Calculated from C_p, β
Nylon (Polyamide--C6 H11 N O)	
C_S	Reference 46
C_L	Calculated from C_S, C_B
C_p, β	Reference 46
Γ	Reference 46

Palladium	
E_s	Reference 39
C_L, C_S	Reference 20
C_p, β	Reference 40
Γ	Calculated from C_p, β
Paraffin	
C_p, β	Handbook of Physics and Chemistry
Chopped Nylon Phenolic	
C_L	Reference 43 (c-direction)
C_S	Calculated from C_L, C_B
C_p, β	General Electric Cincinnati Testing Laboratory information
Γ	Calculated from C_p, β
Tape-Wound Nylon Phenolic	
C_p, β	General Electric Cincinnati Testing Laboratory information
Γ	Calculated from C_p, β
X-Cut Crystalline Quartz	All data taken from Reference 49
Quartz Phenolic	
E_s, C_p, β	Data from McDonnell Douglas Corporation
Γ	Calculated from C_p, β
3-D Quartz Phenolic	
E_s	Data from McDonnell Douglas Corporation for Phenolic Quartz--35 percent resin, $\rho_o = 1.68$

Platinum

E_s	Reference 39
C_L, C_S	Reference 17
C_p, β	Reference 13
γ	Calculated from C_p, β

OTWR

E_s	Approximate
C_L	Reference 43 (a-direction)
C_S	Calculated from C_L, C_B
C_p, β	Reference 46
Γ	Calculated from C_p, β (AFWL-TR-65-188 data)

Phenolic Refrasil

E_s	Reference 44 (Phenolic Resin data)

Tape-Wound Silicon Phenolic

E_s	Data from McDonnell Douglas Corporation for Phenolic Quartz--35 percent resin, $\rho_o = 1.68$

Plexiglas

C_L, C_S	Reference 20
C_p, β	Reference 46
Γ	Reference 46

Polyethylene

E_s	AFWL-TDR-64-42
C_L, C_S	Reference 46
C_p, β	Reference 46
Γ	Reference 46

Polystyrene	
β	Data from McDonnell Douglas Corporation
Polyurethane	
C_L, C_S	Reference 20
RAD 58B	
C_L	Reference 43
C_S	Calculated from C_L, C_B
β	Reference 43
Silver	
E_s	Reference 39
C_L, C_S	Reference 13
C_p, β	Reference 40
Γ	Calculated from C_p, β
Stainless Steel Type 304L	
C_L, C_S	Reference 20
C_p, β	AFWL notes on Stainless Steel
Γ	Calculated from C_p, β
Composition (percent)	Cr/Ni/18/8
Stainless Steel Type 304	
C_L, C_S	Reference 20
C_p, β, Γ	Values used as for Stainless Steel Type 304L
Hugoniot Elastic Limit	Reference 20
Steel, Mild EN3	
β	Handbook of Physics and Chemistry
Composition (percent)	Fe/C/Mn/98.75/0.25/1.0

Tantalum

E_s	Reference 39
C_L, C_S	Reference 13
C_P, β	Reference 40
Γ	Reference 40

Teflon

E_s	Data from AVCO Corporation
C_S	Reference 46
C_L	Calculated from C_S, C_B
C_P, β	Reference 46
Γ	Reference 46

Thallium

C_P, β	Handbook of Physics and Chemistry
Γ	Reference 40

Thorium

E_s	Data from McDonnell Douglas Corporation
C_P, β	Handbook of Physics and Chemistry
Γ	Reference 40
Hugoniot Elastic Limit	Reference 20

Tin

E_s	Reference 39
C_L, C_S	Reference 13
C_P, β	Handbook of Physics and Chemistry
Γ	Reference 40

Titanium

E_s	Reference 39
C_L, C_S	Handbook of Physics and Chemistry
C_p, β	Handbook of Physics and Chemistry
Γ	Reference 40

*The phase transition at 175 kbar is not indicated in this report. See Reference 20.

Tungsten

E_s	Reference 39
C_L, C_S, β, C_p, Y_o	Handbook of Physics and Chemistry
Γ	Calculated from C_p, β

Uranium-Molybdenum Alloy

C_L, C_S	Reference 20
C_p, β	Reference 20
Γ	Reference 20

Vanadium

E_s	Reference 39
C_p, β	Reference 40
Γ	Reference 40

Zinc

E_s	Reference 39
C_L, C_S	Handbook of Physics and Chemistry
C_p, β	Handbook of Physics and Chemistry
Γ	Reference 40

Zirconium

E_s	Reference 39
C_L, C_S	Reference 20
C_P, β	Reference 40
Γ	Reference 40

REFERENCES*

1. Unpublished data from the Air Force Weapons Laboratory Gas Gun Facility.

2. Wagner, M. H., Waldorf, W. F., Jr., Louie, N. A., Determination of Hugoniot Equations of State for Polymers and Reentry Vehicle Materials and Investigations of Fracture Phenomena, AFSWC-62-66, Vol I, Air Force Force Weapons Center, Kirtland AFB, NM.

3. Marsh, S. P., taken from private communication, Los Alamos.

4. Lawrence Radiation Laboratory Data.

5. McQueen, R. C., Marsh, S. P., "Equation of State for Nineteen Metallic Elements from Shock-Wave Measurements to Two Megabars," Journal of Applied Physics, Vol 31, No. 7.

6. Lundergren, C. D., The Hugoniot Equation of State of 6061-T6 Aluminum at Low Pressures, Research Report SC-4637 (RR), Sandia Corporation, September 1961.

7. Anderson, G. D., Doran, D. G., Fahrenbruch, A. L., Equation of State of Solids--Aluminum and Teflon, AFWL-TR-65-147, Air Force Weapons Laboratory, Kirtland AFB, NM, December 1965.

8. Al'tshuler, L. V., Kormer, S. B., Bakanova, A. A., Trunin, R. F., "Equation of State for Aluminum, Copper, and Lead in the High Pressure Region," Soviet Physics/JEPT 11, p. 573, 1960.

9. Taken from progress report No. 11, DA-49-146-XZ-280.

10. Al'tshuler, L. V., Kormer, S. B., Bakanova, A. A., Trunin, R. F., "Equation of State for Aluminum, Copper, and Lead in the High Pressure Region," Soviet Physics/JEPT 11, p. 766, 1960.

11. Skidmore, I. C., Morris, E., Thermodynamics of Nuclear Materials, p. 173 FF, 1962.

12. Fowles, G. R., "Shock Wave Compression of Hardened and Annealed 2024 Aluminum," Journal of Applied Physics, Vol 32, p. 1475, 1961.

13. Walsh, J. M., Rice, M. H., McQueen, R. G., Yarger, F. L., "Shock-Wave Compression of Twenty-Seven Metals," Physical Review, Vol 108, No. 2, pp. 196-216, October 1957.

14. Al'tshuler, L. V., Bakanova, A. A., Trunin, R. F., "Shock Adiabats and Zero Isotherms of Seven Metals at High Pressures," Soviet Physics/JEPT, Vol 15, p. 65, 1962.

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*References 2 through 18 are taken from LRL Compendium of Shock Wave Data.

REFERENCES (cont'd)

15. Al'tshuler, L. V., Bakanova, A. A., Trunin, R. F., "Shock Adiabats and Zero Isotherms of Seven Metals at High Pressures," Soviet Physics/JEPT, Vol 15, p. 65, 1962.

16. Al'tshuler, L. V., Krupnikov, K. K., Brazhnik, M. I., "Dynamic Compressibility of Metals under Pressure from 400,000 to 4,000,000 Atmospheres," Soviet Physics/JEPT, Vol 7, p. 614, 1958.

17. McQueen, R. G., Marsh, S. P., Report No. GMX-6-566, Los Alamos Scientific Laboratory, pp. 51-62, 1964.

18. Krupnikov, K. K., Bakanova, A. A., Soviet Physics/JEPT, Vol 8, p 205, 1963.

19. Rinehart, J. S., Compilation of Dynamic Equation of State Data for Solids and Liquids, Technical Publication 3798, US Naval Ordnance Test Station, May 1965.

20. McQueen, R. G. et al., High Velocity Impact Phenomena, R. Kinslow, ed., Academic Press, NY (taken from preprint copy).

21. Taylor, John W., Rice, M. H., "Elastic-Plastic Properties of Iron," Journal of Applied Physics, Vol 34, p. 364, 1963.

22. Keough, D. D., Procedure for Fabrication and Operation of Manganin Shock Pressure Gages, AFWL-TR-68-57, Air Force Weapons Laboratory, Kirtland AFB, NM, August 1968.

23. Louie, N. A., Kinney, W. W., Reid, R. D., Jr., Dynamic Properties of Materials, AFWL-TR-68-101, Air Force Weapons Laboratory, Kirtland AFB, NM, 1968.

24. Munson, D. E., Barker, L. M., "Dynamically Determined Pressure-Volume Relationships for Aluminum, Copper, and Lead," Journal of Applied Physics, Vol 37, pp. 1652-1660, 1966.

25. Anderson, G. D., Fahrenbruch, A. L., Equation of State of Solids, II--Aluminum and Teflon," AFWL-TR-67-43, Air Force Weapons Laboratory, Kirtland AFB, NM, September 1967.

26. Guess, T. R., Some Dynamic Mechanical Properties of an Epoxy, Sandia Corporation, New Mexico, SC-DR-68-343, 1968.

27. Los Alamos Scientific Laboratory, private communication.

28. Wackerle, J., "Shock-Wave Compression of Quartz," Journal of Applied Physics, Vol 33, No. 3, 1962.

29. See Boeing Document, Equation of State of Mylar, Boeing-D2-90099, 1962.

30. Wagner, M. H., Louie, N. A., Determination of Hugoniot Equation-of-State for Polymers and Reentry Vehicle Materials and Investigations of Fracture Phenomena, SWC-TDR-62-66, Vol II, Air Force Special Weapons Center, Kirtland AFB, NM, August 1962.

REFERENCES (cont'd)

31. Hartman, W. F., Smith, J. H., Response of Several Ablation Materials to Dynamic Loading, SC-4647, Sandia Corporation, NM, January 1962.

32. Bancroft, D., Peterson, E. L., Minshall, S., "Polymorphism of Iron at High Pressure," Journal of Applied Physics, Vol 27, No. 3, 1956.

33. Isbell, W. M., Froula, N., Shipman, F. H., Shock Wave Propagation and Equation-of-State Measurements of Quartz Phenolic, Final Report, BSD-TR-67-25, Vol 3, 1967.

34. Isbell, W. M., Froula, N., Shipman, F. H., Shock Wave Propagation and Equation-of-State Measurements of Quartz Phenolic, Final Report, BSD-TR-67-25, Vol 3, 1967.

35. Doran, D. G., "Hugoniot Equation of State of Pyrolytic Graphite to 300 Kilobars," Journal of Applied Physics, Vol 34, No. 4, p. 844, 1963.

36. Allen, R. G., Goodwin, L. K., Study of X-Ray Countermeasure Methods, Final Report, AFWL-TDR-64-42, Air Force Weapons Laboratory, Kirtland AFB, NM, June 1964.

37. Morgan, D. T., Rockowitz, M., Atkinson, A. L., Measurement of Gruneisen Parameter and the Internal Energy Dependence of the Solid Equation of State for Aluminum and Teflon, AFWL-TR-65-117, Air Force Weapons Laboratory, Kirtland AFB, NM, 1965.

38. Morgan, D. T., Rockowitz, M., Atkinson, A. L., Measurement of the Gruneisen Parameter and the Internal Energy Dependence of the Solid Equation of State of Aluminum and Teflon, AFWL-TR-65-117, Air Force Weapons Laboratory. Kirtland AFB, NM, October 1965.

39. Stull and Sinke, Thermodynamic Properties of the Elements, American Chemical Society, Washington, 1956.

40. Seitz, F., Turnbull, D., Solid State Physics, Vol 16, Academic Press, 1964.

41. "The Compressibility of Pyrolytic Graphite," US Naval Ordnance Laboratory, J. Chem. Phys., Vol 40, p. 71, 1963.

42. Penning, J. R., Davies, F. W., Hugoniot Equation of State of Mylar, taken from preprint of Boeing Document D2-125304-1.

43. Asay, J. R., Darr, A. J., Arnold, N. D., Guenther, A. H., Ultrasonic Wave Velocity-Temperature Studies in Several Plastics, Plastic Foams and Nose Cone Materials, AFWL-TR-65-188, Air Force Weapons Laboratory, Kirtland AFB, NM, March 1966.

44. Radiation Damage Study (RADS), Vol 5, Final Report, Material Data Handbook, BSD-TR-66-372, 1966.

45. Louie, N. A., Anderson, W. H., Experimental Fracture Studies and Equation-of-State Measurements, Final Report, RTD-TDR-63-3102, Air Force Weapons Laboratory, Kirtland AFB, NM, March 1964.

REFERENCES (cont'd)

46. Asay, J. R., Urzendowski, S. R., Guenther, A. H., Ultrasonic and Thermal Studies of Selected Plastics, Laminated Materials, and Metals, AFWL-TR-67-91, Air Force Weapons Laboratory, Kirtland AFB, NM, January 1968.

47. Crotwell, G. P., Jr., Hugoniot Data on Several Materials, AFWL-TR-68-82, Air Force Weapons Laboratory, Kirtland AFB, NM, October 1968.

48. Toulaukian, Y. S., Thermodynamic Properties of High Temperature Solid Materials, 6 Volumes, Thermophysical Properties Research Center, Purdue University, Macmillan, 1967.

49. Bakken, L. H., Anderson, P. D., Memo, "Correction of Equation of State Values in SCL-TM-67-118," Sandia Corporation, New Mexico, 1968.

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13. ABSTRACT

(Distribution Limitation Statement No. 2)
Computer codes for predicting material response to shock loading in and above the elastic region of a material require a knowledge of the Hugoniot equation of state. Hugoniot and material data have been compiled from various sources on materials of interest and presented in a form which condenses the needed computer code inputs to an easily accessible source.

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